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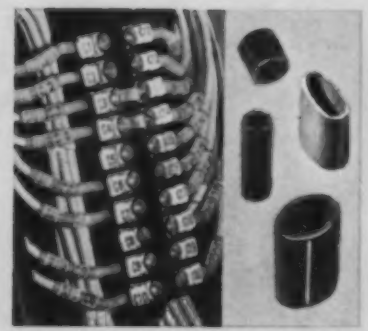

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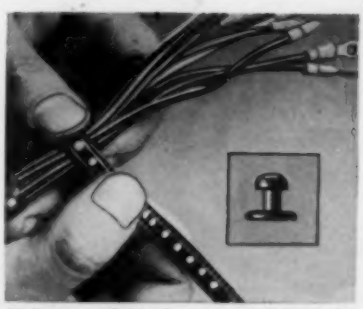

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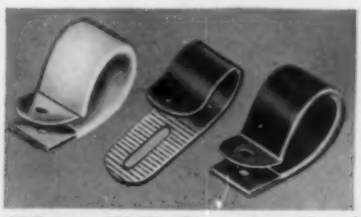

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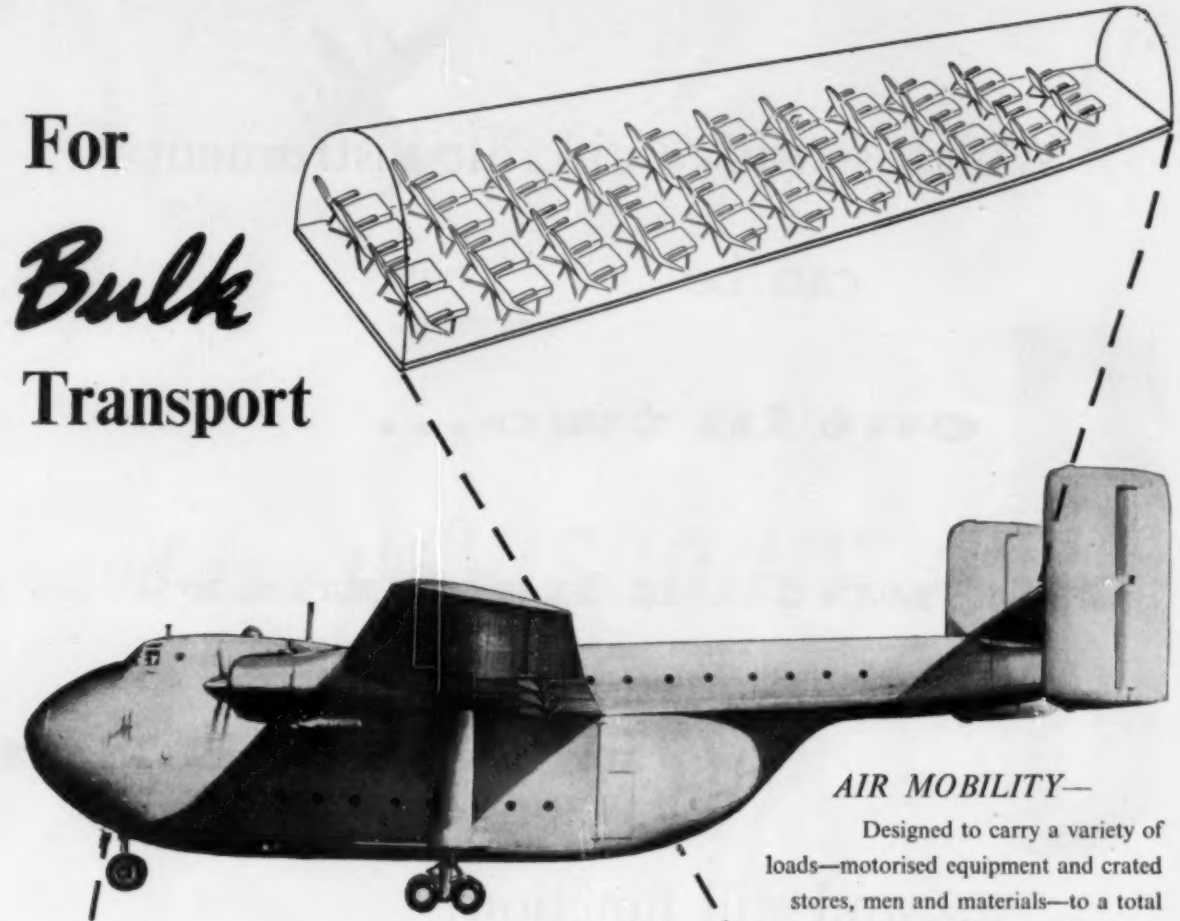

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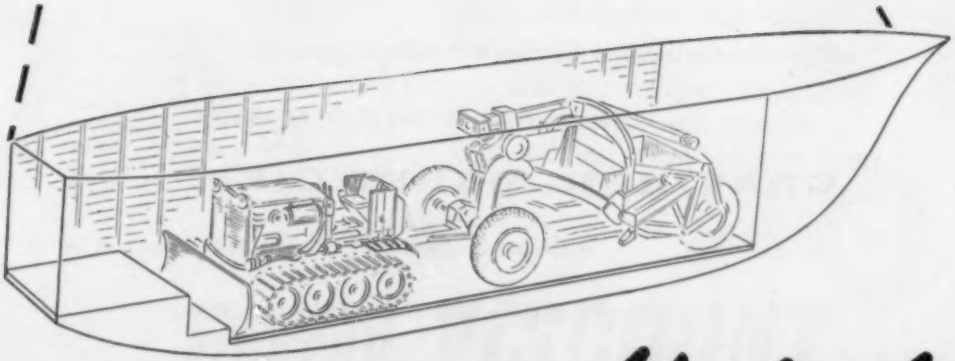

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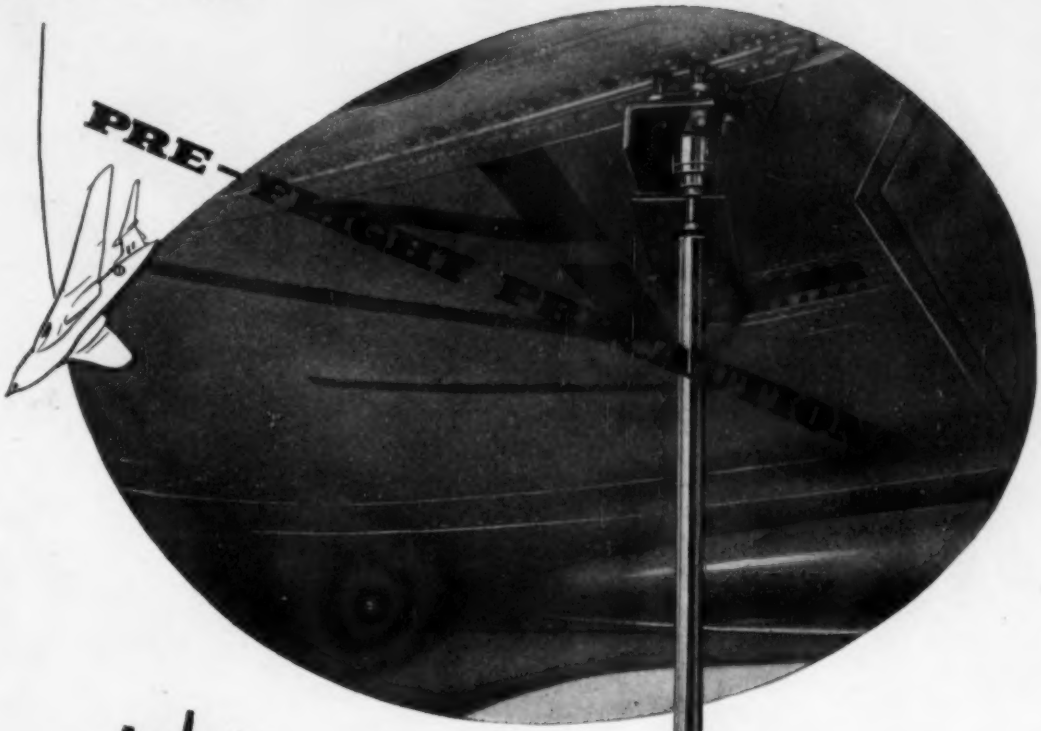

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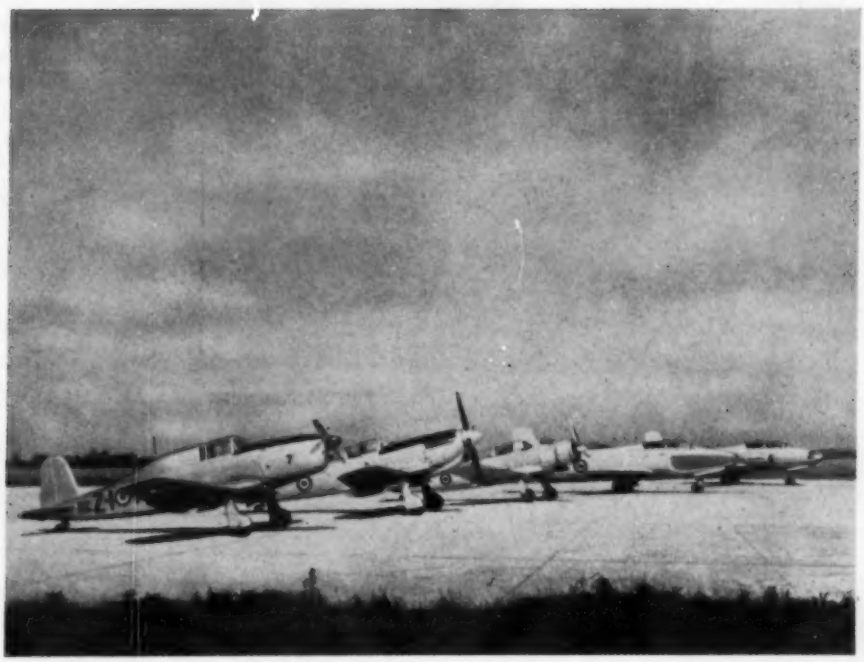

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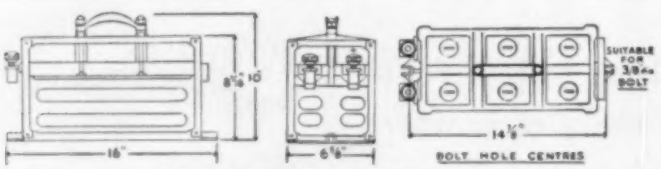

Side and end views of 6-EP19B/2 with battery layout diagram

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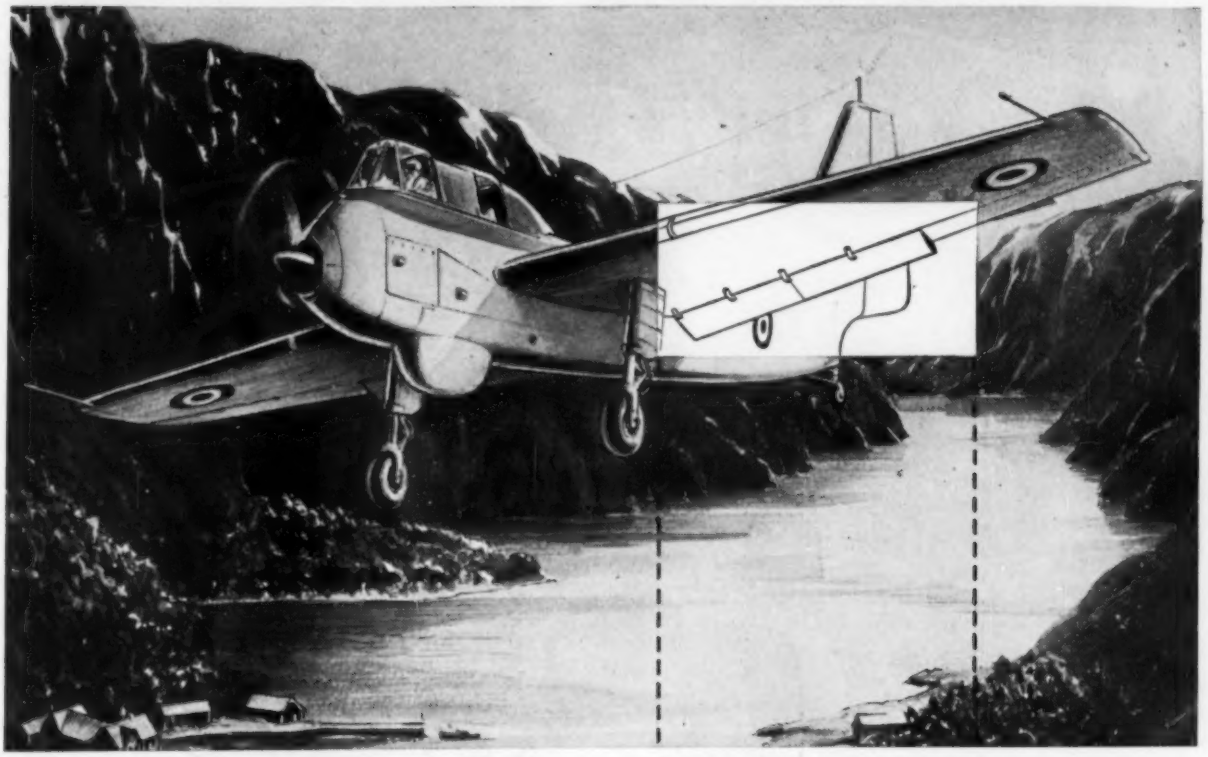

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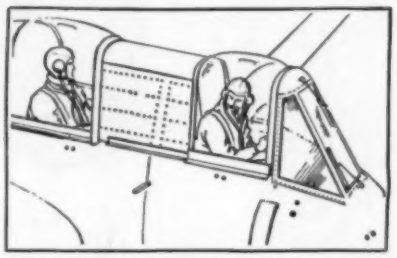

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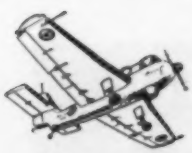

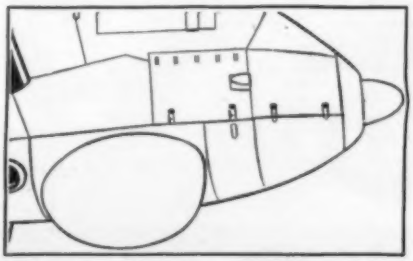

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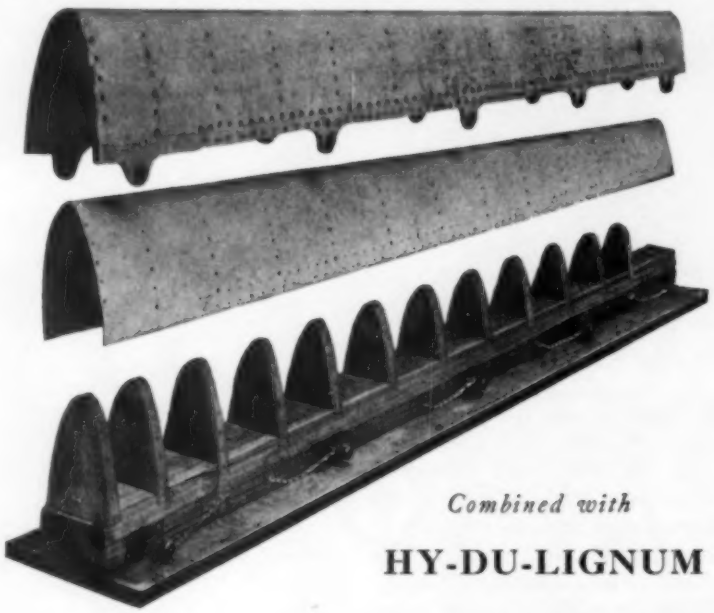

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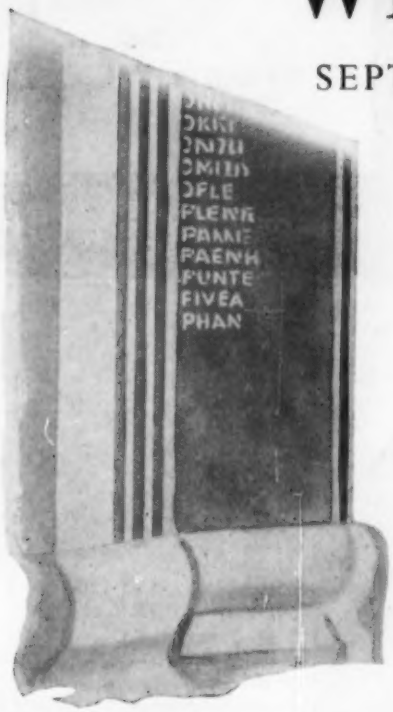

Time effaces the material scars of battle—but not the human ones.

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Founded 1909

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IN THIS ISSUE:

The Week's News - - 434
Farnborough Reviewed:
The Display - - - - 437
Aircraft - - - - - 440
Missiles - - - - - 451
Engines - - - - - 452
The Problem of Noise - 457
Vampires without Wings 459
Service Aviation - - - 462
Civil Aviation - - - - 463
The Aeronautical Bookshelf 466
The Industry - - - - 467

Turbo-Levitation

HAD such men as Cayley or Stringfellow been able to call upon the power of a gas turbine it is quite possible that fixed-wing aircraft of the kind we know today would have progressed little farther than has the ornithopter. In the absence of such power or in fact of any practical power at all, the great aviation pioneers of the previous century could do little more than scheme and design. In paying tribute to the Wright brothers' efforts some fifty years later, and in celebrating their success, few people have given sufficient credit for the engine of the earliest biplane. Yet it was the Wrights' decision to build their own 12 h.p. engine (weighing 14 lb per h.p.) that made possible their historic first flights.

Only in recent years—months almost—has technical progress made vertical take-off by jet thrust (other than from short-duration rockets) a practical proposition. In an intermediate and marginal position is V.T.O. with the aid of airscrews. These two are, of course, very different from take-off and hovering flight by a helicopter with powered rotating wings. Several V.T.O. projects were discussed in *Flight* last week.

At this early stage it is very gratifying indeed to know that the great firm of Rolls-Royce has, in conjunction with the Ministry of Supply, initiated experiments with a vertical take-off jet machine. Even more gratifying is the fact that the device has already lifted its operator or pilot under such control that he felt justified in continuing the ascent to nearly 200 feet. The intention has so far been no more than to explore possibilities of getting airborne and of controlling the machine in the air. It is not really surprising that this "flying bedstead" should be no more than a light framework with four long legs, two Nene turbojets, a fuel tank, a seat and small levers for power and efflux control.

After encouraging initial experiments, having gas turbines which are much lighter and more powerful than the centrifugal Nenes and with several excellent reasons for following this particular line of research, it may be expected that a completely new class of aircraft will eventually emerge. The significance of this practical step in development is, in fact, immense and the possibilities now opened up may in time profoundly affect aircraft (and airfield) design.

If anyone has any doubts as to the value of vertical take-off and landing, let him feast his eyes upon the runways of any large airport, especially, perhaps those at London Airport, which is a fine example of the demands of modern commercial aviation. Let him then drive down to one of the reconditioned military airfields recently prepared for American bombers operating from this country. There he may gaze upon thousands of acres of precious earth covered with concrete. The cost of it all is staggering; the area is quite sufficient to provide a second parallel carriageway for the entire length of each of Britain's congested trunk roads.

In America, Mr. Ernest Stout, design engineer of the Convair Company, is one man who has declared war on concrete—as a result, in the first place, we believe, of experiences during Pacific island operations in the Japanese war. His firm has produced one of the American Navy's two V.T.O. turboprop prototypes; in addition he has pioneered the Sea Dart hydro-ski fighter which is land-based, but which uses water (or snow or ice) for take-off and landing. Finally, Convair are most active in the large flying-boat field.

American conditions and requirements differ from our own and we do not, of course, suggest that British manufacturers should emulate this great American organization; we do, however, suggest a few apposite matters for consideration, with jet-lift developments in mind. The first is that these small islands cannot afford either the space or the money to lay down more and more new airfields and to extend existing runways; yet both civil and military aircraft of conventional type have each year required, and are still requiring, additional and bigger airfields. Secondly, several kinds of air operation can only be performed or are best performed by machines which can rise vertically and hover. Helicopter development (and this particular kind of vertical riser is limited in its applications and has several shortcomings) is only just getting under way in England. Lastly, this island kingdom which has such good reason for employing flying-boats for both military and commercial duties and which in the past has shown an extraordinary aptitude for building them, has now abandoned them completely.

STRANGE REVIEW: The statue of Field Marshal Earl Roberts appears to be surveying the historic British and German aircraft assembled on Horse Guards' Parade, London, for Battle of Britain Week. The machines will be recognized as Hurricane, Spitfire, Heinkel He 111, Junkers Ju 88 and Messerschmitt 109. Serials of the Hurricane and Spitfire—for those interested—are L1592 and X4590 respectively.

FROM ALL QUARTERS

Polar Route Progress

ON September 10th S.A.S. officially confirmed that their trans-Polar service will begin on November 15th. Douglas DC-6Bs will leave Copenhagen at 8.10 p.m. local time on Mondays and Fridays, arriving 27 hr 10 min later at Los Angeles. Refuelling points on the route will be Sondre Stromfjord (Greenland) and Winnipeg. The return flights, departing from Los Angeles on Mondays and Thursdays at 0005 hr, will take 24 hr 20 min. Total length of the new route is 5,160 miles—980 miles less than the usual route from Copenhagen to Los Angeles *via* New York.

Canadian Pacific Airlines announced on September 11th that they had applied for Canadian Government approval to operate a similar service between Vancouver and Amsterdam. C.P.A. already operate their DC-6Bs across the North and South Pacific. The new service, along a 4,825-mile route with a single refuelling stop, would, it is claimed, make possible the fastest service between Australia and Europe.

Helicopter Association's New President

INDICATIVE of the interest now being taken in helicopters is the fact that a distinguished gathering of nearly 400 attended the eighth annual dinner of the Helicopter Association of Great Britain at the Dorchester Hotel on September 9th. In the chair was Mr. Eric Mensforth, president of the Association, and representatives of rotating-wing interests from all over the world were present.

In proposing the toast of "The Association," Lord Brabazon of Tara recalled, in an amusing vein, some events of the early Autogiro days that led up to the development of the helicopter. He referred to the recently announced "flying bedstead," but thought there would be room for both this and the helicopter in the future.

The president, after reviewing the achievements of the past year, announced that his term of office would end in 1955 and that Lord Douglas of Kirtleside, chairman of B.E.A., had honoured the Association by accepting nomination as the new president. Mr. Mensforth also announced that Capt. R. N. Liptrot had been elected to honorary membership of the Association.

Sir Miles Thomas, chairman of B.O.A.C., in reply to the toast of "The Guests," expressed his opinion that the transport helicopter would do much to bring aviation to the provincial cities of Great Britain at a lower cost than could the fixed-wing airliner.

Before the dinner, the Association had listened to an excellent lecture delivered by Mr. Knute W. Flint of Bahamas Helicopters, Ltd., on the subject of *Helicopter Contracting*. Mr. Flint had also shown, and given a commentary on, a film portraying one of his recent oil survey operations in the jungles of New Guinea. He had been engaged in helicopter operations for ten years and his description of the operations and comment on future possibilities for the private operator of helicopters were most interesting and illuminating. We hope to publish a digest of the lecture in a forthcoming issue.

Air France and the Comet 1

INACCURATE assertions in French newspapers recently resulted in Air France issuing a statement on negotiations in progress between the airline and the de Havilland Aircraft Co. on the subject of loss of revenue caused by the grounding of the Series 1 Comets. Air France denied that there was any question of a lawsuit for compensation, and said that the negotiatons with de Havilland were "most friendly."

The airline operated three Comet 1As until all aircraft of this type were grounded on April 4th. The French independent airline U.A.T., which operated two Comet 1As, and have Comet 2s on order, have refused to make any comment on the subject of negotiations with de Havilland, who have also declined to comment on the Air France statement.

Apart from loss of revenue caused to operators by the long period of grounding and from the effect of having much capital tied up in Comets (this applies particularly to U.A.T., which is a private company) it is felt by some people in France that the Series 1 Comets can never return to passenger service.

The somewhat nebulous talk of compensation in France—natural enough in itself—seems to centre around a French proposal that Great Britain (presumably through the Ministry of Supply) ought to repurchase the Comet 1s and use them for experimental and military purposes.

From the British point of view it is obviously in our best interests to try to look after good customers; it will be recalled that these French operators were among the very first to support the new British turbine airliners with orders. Any obligation, of course, is purely a moral one.

FREEDOM OF THE BOROUGH was presented by the Mayor of Grimsby, last week, to No. 12 Bomber Squadron, from nearby Binbrook. Seen receiving the scroll from Ald. W. Harris is the Squadron Commander, S/L. F. C. D. Wright. The senior officers are (left to right) A.V-M. J. R. Whitley, A.O.C. No. 1 Group, Bomber Command; A. Cdre. H. E. Nowell, Director of Organization, Air Ministry; and G/C. J. N. Tomes, Station Commander at Binbrook. Afterwards the squadron marched through Grimsby with bayonets fixed—their new privilege.

A FLAME REKINDLED: Although a rocket-propelled intercepter—the Me 163—was operational in World War II, serious interest in aircraft of this class has only lately been revived. Precursor of a prototype by S.N.C.A.S.O. is the S.O. 9000 Trident, seen here taking off under the power of its SEPR rockets and Turbomeca auxiliary tip-mounted jets. Speed exceeding Mach 1.5 in level flight is expected.

ASSAULT TRANSPORT: The first production-model Chase C-123B Avitruc to be built by Fairchild, and shown on the left, made its initial flight on September 1st. Avitruc production is being integrated with that of C-119s, and Fairchild-introduced modifications include a huge dorsal fin, spring tabs on rudder and elevators, undercarriage doors, paratroop doors and de-icing. The engines are Pratt and Whitney R-2800s, which give a range of 850 miles with a 16,000 lb payload.

First Avon-Sabre Delivered

ON August 30th the Australian Prime Minister visited Laverton aerodrome to officiate at the handing-over ceremony of the first production Avon-Sabre for the Royal Australian Air Force. Ninety of these aircraft have been ordered from the Commonwealth Aircraft Corporation, at whose Fishermen's Bend factory they are now in production. The Avon-Sabre was conspicuous by its absence on an earlier occasion, staged to mark "Made in Australia" Week, when a mixed R.A.A.F. formation flew over Melbourne. The types then involved were a Lincoln flanked by a Wirraway and a Winjeel and followed by a Canberra, a Vampire fighter, a Vampire trainer and a Mustang.

Reports in the Sydney newspapers indicate that Australia's aircraft industry is coming in for some criticism, arising from slow delivery and high costs of aircraft now in production. The *Sydney Sun*, for example, reports that the cost of the locally-built Canberra has risen from a figure of £317,000 to nearer £450,000.

America's National Show

THE National Aircraft Show at Dayton, Ohio, was productive of some very good racing times and spectacular demonstrations by the U.S. armed Services. Winner of the Bendix Trophy Race was Captain Edward D. Kenny, who flew a Republic F-84F Thunderstreak from Edwards A.F.B. California, to Cook's Airport—a distance of 1,900 miles—in 3 hr 1 min 56 sec at an average speed of 616.208 m.p.h. Victor in the Thompson Trophy event was Captain Eugene P. Sonnenberg, who averaged 692.823 m.p.h. over the 100 km closed course in a North American F-86H. The Allison Trophy event, as reported last week, was in the form of an interception exercise and was won by the crew of a Northrop F-89 Scorpion which climbed to 10,000ft in 2 min 7 sec.

On each day of the Show twelve Boeing B-47 Stratojets flew over the airfield on a routine flight from England. A luckless participant in the Bendix Trophy event was a pilot who was disqualified because one of his wing-tip tanks disintegrated as he was crossing the finishing line. He landed safely.

The R.Ae.C. Rally

THE belt of rain and low cloud which passed over Southern England during the morning of Thursday of last week was unfortunately moving into the flight paths of most of the light aircraft *en route* to White Waltham for the Royal Aero Club's International Invitation Air Rally. By dusk that evening, however, some two-thirds of the expected 43 machines had arrived, including a number of Danish K.Z.3s and K.Z.7s, Ryan Navions (one an extremely smart Super 260 from Switzerland), Austers, Pipers, a Tiger Moth from Luxembourg, a Sokol M.1.D, Ercoupes, a Globe Swift, a Cessna 140 and a shiny 170. Eventually, the total of guests reached 74, in 36 aircraft. They came from nine different countries, Belgium heading the list with 11 aircraft.

Pilots, passengers and their R.Ae.C. hosts later dined at the

"THE COMPLETE ANSWER to those who doubted Australia's ability to build a first-line fighter aircraft," was how Mr. R. G. Menzies, the Australian Prime Minister, described the Avon-Sabre. He was speaking at the handing-over ceremony, depicted here and referred to above. Aircraft visible in the line-up are, a Winjeel, Commonwealth-built Beaufighter, Wirraway, the Avon-Sabre, and Commonwealth-built Mustang.

FROM ALL QUARTERS . . .

Guards' Boat club, Maidenhead, where a pleasantly mild evening, pipe-and-drum music by the Coldstream Guards, and the beautiful riverside location complemented an admirable dinner in a worthy opening to the rally. The guests were welcomed by Air Marshal Sir John Boothman, vice-chairman of the Royal Aero Club, whose Service appointment [C-in-C., Coastal Command], he said, was concerned with the sort of flying in which one switched the autopilot on and then took out a deck of cards. Although he himself had given up "risking his neck in those funny little aeroplanes" some years ago, he was pleased that the Club was now able to return some of the hospitality received by its members on the Continent. Among the guests was Mr. Peter Gluckman, the American pilot who recently flew the Atlantic solo both ways in a single-engined Luscombe.

A reply on behalf of the guests was voiced by Mr. C. Kolff, of Holland, president of the Fédération Aéronautique Internationale.

On Friday, guests were taken to visit the S.B.A.C. show at Farnborough, where they were able to enjoy the hospitality of the Esso and Shell-Mex caravans. In the evening guests, hosts and supporters again met at the Guards' Boat Club for a very pleasant dinner and dance. The numbers on this occasion reached 250. For the Saturday the 74 guests from abroad split up into parties to visit British clubs, 21 being looked after at Cambridge, 18 more at Bedford, a further group by the Yorkshire Aeroplane Club, and others in private homes. The Cambridge party visited colleges and enjoyed a river trip, and eventually joined those from Bedford on Sunday afternoon, when the whole lot visited Old Warden Aerodrome, near Biggleswade, to see the Shuttleworth Collection. The programme finished with a quiet dinner on Sunday night for those who had not already set course for home.

U.S. Guided-Weapon Missions

NOT surprisingly, perhaps, following the recent announcement by the Minister of Supply concerning Anglo-U.S. co-operation in guided-weapon development, two missions from the United States are at present in this country. One of them, led by Mr. Trevor Gardner, special assistant to the Air Force Secretary, is from the U.S.A.F.; the other, headed by Admiral Sides, is from the U.S. Navy.

They saw the S.B.A.C. Display last week, and on the Thursday were entertained to luncheon by Mr. Duncan Sandys. During their stay they will visit guided-weapon establishments and the works of various firms engaged on missile development.

A British Mission is shortly to pay a reciprocal visit to the United States.

For Japanese Defence

FROM Tokyo comes a list, believed to be reliable, of the types of aircraft which the United States is loaning to the three arms of the Japanese National Defense Agency. The "Land Self-defense Force" is to receive eight L-5 and seven L-7 liaison aircraft and an unknown number of helicopters. The "Naval Self-defense Force" will receive seventeen P2V Neptunes, ten TBM Avengers, two PBY flying-boats and twelve SNJ trainers.

By far the most impressive list is that for the "Air Self-defense Force," which is to receive forty-five F-86F Sabres, nineteen F-86D Sabres, twenty C-46 Commando transports, sixty-five T-6G trainers and fifteen T-33 jet trainers.

Some of these aircraft—mainly trainers—have already been delivered. A number of Sabres will be included in the second batch, the arrival of which is expected shortly.

Aircraft Engineering Hazards

THE effects of vibration, the handling of toxic substances, and the ground testing of pressure-cabin installations formed the three main aspects discussed by W/C. F. Latham, M.D., B.Sc., Ch.B., in a paper on *The Medical Problems of the Aircraft Engineer*, read before the Society of Licensed Aircraft Engineers at Farnborough on September 6th.

Low-frequency vibration, audio-frequency noise and ultrasonic frequencies were discussed in turn by the lecturer, who listed objectively the evidence of noise damage to humans, the factors influencing deafness, and methods of protection from excessive noise. Concerning toxic substances, W/C. Latham referred to the properties of petrol, kerosine, liquid oxygen, hydrogen peroxide and hydraulic fluids, and stressed the need for careful evaluation of toxicity.

Personnel exposed to pressure-changes in the testing of pressure-cabin installations, the lecturer suggested, should have a special medical examination, and in general should be under 45 years of age. Whatever the particular hazard, he concluded, all the newer problems could be solved only by close co-operation between the engineers and the aviation medicine specialist.

OTHER AIR NEWS

AIRCRAFT of both fixed-wing and helicopter types were employed in large numbers to carry supplies to Orléansville, Algeria, and to bring out casualties, following the disastrous earthquake on September 9th. They included four Shackletons of Coastal Command.

* * *

AUSTRALIA is expecting delivery of her new carrier, the 14,000-ton *Melbourne*, next August or September. Now being built by Vickers-Armstrongs at Barrow, the ship is likely to have both a steam catapult and an angled deck. *Vengeance* (13,390 tons) will be returned to the British Navy shortly before the new vessel is taken over.

* * *

A MONUMENT has been unveiled at Wasaga Beach, Ontario, to mark the take-off point of the first transatlantic flight from the Canadian mainland to England. The flight was made on August 8th-9th, 1934 by James Ayling and the late Leonard Reid. Flying the D.H. Dragon previously owned by the Mollisons, they landed at Heston after 30 hr 55 min in the air.

* * *

IN connection with the Commercial Transport Exhibition at Earls Court from September 24th to October 2nd, our associated journal *Motor Transport* is publishing two special numbers—a buyers' guide appearing today, September 17th, and a show report next Friday, the 24th. The buyers' guide will contain detailed specifications of all goods and passenger vehicles on the British market.

* * *

FOR all who have been associated with airships, whether as Service or civil air or ground crews, or as designers, or simply as those who have taken an historical interest in lighter-than-air craft, a reunion dinner is to be held on Friday, November 26th. It will take place at the Aviation Centre, Londonderry House, Park Lane, London, W.1. Films made available by Lord Ventry will be shown, and the Royal Aero Club will display photographs and other items of historical interest. Tickets (30s) and further details are obtainable from the hon. secretary of the Organizing Committee, Mr. J. Fairley, Cranwich, near Watersplash, London Colney, Herts.

The Air Ministry states that Abingdon, Berkshire, included in its list (published last week) of R.A.F. stations "at home" to the public tomorrow, Saturday, will not in fact be open.

* * *

A FURTHER increase of United States air power in Europe was announced last week. It is planned to send fighter-bomber and troop-carrier units for tours of duty. They will be in addition to the 14 wings of various types already based in England or on the Continent, and to the two wings of Strategic Air Command operating from bases in Europe and North Africa under a rotation scheme.

* * *

TRUE to form, within 48 hours of the revelation of the Rolls-Royce vertical-take-off design at least one Soviet radio station reported that Russian designers had developed V.T.O. aircraft long before any took to the air in the West. This was followed by the familiar claims to priority in evolving the aeroplane, helicopter, internal combustion engine, steam engine and, in fact, most inventions of any importance.

* * *

THE College of Aeronautics announces that the English Electric Research Fellowship in aeronautics for the academic year 1954-55 has been awarded to Mr. M. E. Filby of Brockworth, Gloucester, a member of the research department of the Gloster Aircraft Co., Ltd. It is also announced that the Perring Scholarship for the two-year course beginning next month has been awarded to Mr. G. E. Smith, of London, N.13.

* * *

THUNDERBOLTS and Mitchells were among the aircraft being used by the Chinese Nationalists in their attacks on the Chinese Communist coastal positions last week. On the Wednesday it was reported that F-84 Thunderjets, supplied by the United States, had also been in action; and Sabres were said to be in reserve for future operations. The Communists claimed to have shot down three of a force of Nationalist aircraft which raided the port of Amoy.

"Flight" photograph

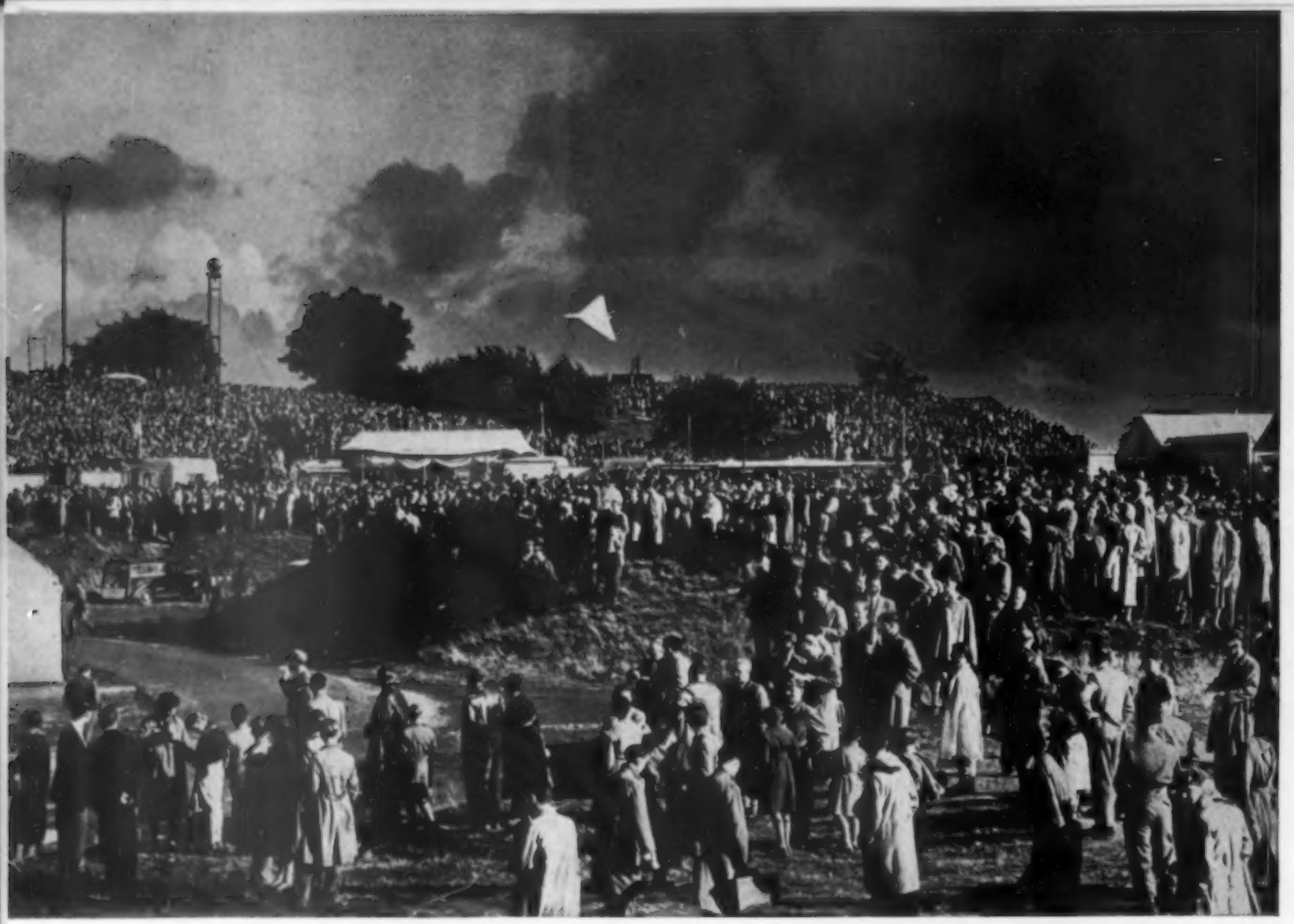
Farnborough weather and drama epitomized: Above, the Hawker Hunter F.6, and below—cocooned in water vapour—the Vickers Valiant B.2.

FARNBOROUGH REVIEWED

SERIOUS S.B.A.C. work completed, historic Farnborough airfield was invaded last week-end by the public in their tens of thousands, and both climatic and climactic the two days proved to be. After Monday's memorable "all-weather" flying display, described last week, how different were the exciting conditions of Sunday! It was between towering clouds and shafts of brilliant sunlight that the Swift made what must have been the most perfectly timed and positioned of sonic dives, visible from the start to finish, complete with condensation puffs and culminating in the almost simultaneous arrivals of double bang and aircraft along the runway.

Summing up, we have no hesitation in saying that the 15th presentation of the unique S.B.A.C. Show lived up to the magnificent reputation set by its predecessors. There were virtually no hitches in the entire complex programme, and though the exhibition was the biggest yet its administration showed no signs of strain.

Perhaps the only disappointment worthy of mention here was the decision not to show the supersonic English Electric P.1, which represents the apex of current British achievement in the realm of high-speed flight. Nevertheless, on the evidence of progress apparent or implicit at this year's S.B.A.C. Show (particularly with power-plants), it seems likely that the P.1 may be but one of many highlights at the 1955 "Farnborough."



Sunshine, storm-clouds and the Avro Vulcan helped to compose this dramatic "Flight" photograph, taken on Saturday.

FARNBOROUGH REVIEWED . . .

PUBLIC DAYS

NOT the least impressive feature of Farnborough week was the size of the enthusiastic crowd which watched Sunday's display. It was estimated that 160,000 people saw the flying from the enclosures bordering the runway or the flag-lined slopes overlooking it, from the parks containing over 21,000 vehicles, or from the wire-meshed fringe of the airfield. This was a record attendance for any public day since the inception of the show and compares with 153,000 on the Sunday last year. On Friday, the first of the public days, bad weather and high admission prices restricted attendance to 21,000 but on Saturday, despite a torrential downpour which marred the first half-hour of the flying programme, there were 112,000 visitors. Attendances on the Tuesday, Wednesday and Thursday are given as 55,000, so that (counting the gathering of technicians and pressmen who witnessed Monday's preview) it may safely be assumed that 350,000 people saw the show.

Announcements of significance were made on Sunday by Mr. J. J. Parkes, president of the S.B.A.C., who said that overseas attendances of both military and civil observers had reached higher figures than ever before. He also said that Gen. Norstad and officials of S.H.A.P.E. had shown keen interest in the Folland Midge, precursor of the Gnat light fighter and outstanding performer among the wholly new aircraft seen at Farnborough this year. Mr. Parkes confirmed that the show would take place as usual next year and said that the S.B.A.C. saw no reason why it should not continue as an annual event.

Magnificent flying in bright sunshine rewarded the perseverance of Saturday's crowd, who barely flinched beneath the cloudburst-and-thunderclap overture to the individual demonstrations. Moving around the packed enclosures, one soon became conscious that interest in the Midge is by no means confined to the experts. The fantastic acceleration of the Olympus-Canberra, from quiet horizontal flight at little more than landing speed to roaring near-vertical climb, was much appreciated; so too was Hazelden's handling of the brand-new second Victor, which had made a 57-minute maiden flight only on Saturday morning, and still lacked covers for the main undercarriage bogies. Designer Stafford was aboard on Saturday, and on Sunday the Victor carried Mr. W. H. MacRostie, Handley Page's chief engineer; on both days it made a touch-and-go landing before climbing away quickly for Radlett. Superficially, the new Victor appeared identical with the first prototype, which was destroyed last July. Sir Frederick Handley Page said on Saturday that the cause of the accident was known and that the defect had been remedied by a minor modification of the tailplane.

The supersonic bangs seemed bigger and better than at any previous display; Duke, Lithgow and Morgan flying, respectively, the Hunter 6, Supermarine 525 and Swift—showed themselves not only capable of aiming the bang with complete accuracy but of arriving over the runway simultaneously with the sound of their supersonic approach. The D.H. 110 also "banged" on Saturday, but was forced by loss of radio contact with the tower to postpone its low-level demonstration. Such few untoward incidents as occurred were barely noticeable. Overnight repairs were effected of the Viscount 700 prototype, wearing B.W.I.A. markings, which burst a tyre while landing on Saturday, and of the Valiant, which was slightly damaged by taxying blast from the Vulcan shortly before take-off.

THE WEEK'S FLYING

DESPITE its title, each year's S.B.A.C. Flying Display is in fact a series of flying displays. Small changes in demonstration routine or sequence all contribute to the individual impression formed of any one afternoon's flying programme.

On the opening day, September 6th, pilots triumphed over the worst possible flying weather, and in our published report of last Friday we observed that "new contributions were made to the art of demonstration flying." Nevertheless, it was inevitable that the Monday's poor visibility should cause curtailment of most performances and cancellation of others. Much improved conditions on the remaining guest days—Tuesday, Wednesday and Thursday—enables us to present now a "composite" report of three complete, splendid displays.

First away each afternoon was the Proteus-Ambassador, which showed its elegant paces most fully on transport day, September 9th. Turbine-quietness provided aural compensation for the over-wing bulges produced by the Proteus jet-pipes, and the short take-off and steep climb were convincing. Next came another test-bed, Napier's roomy Eland Varsity, which on Thursday returned from a rapid climb-away with one of its 3,000 h.p.

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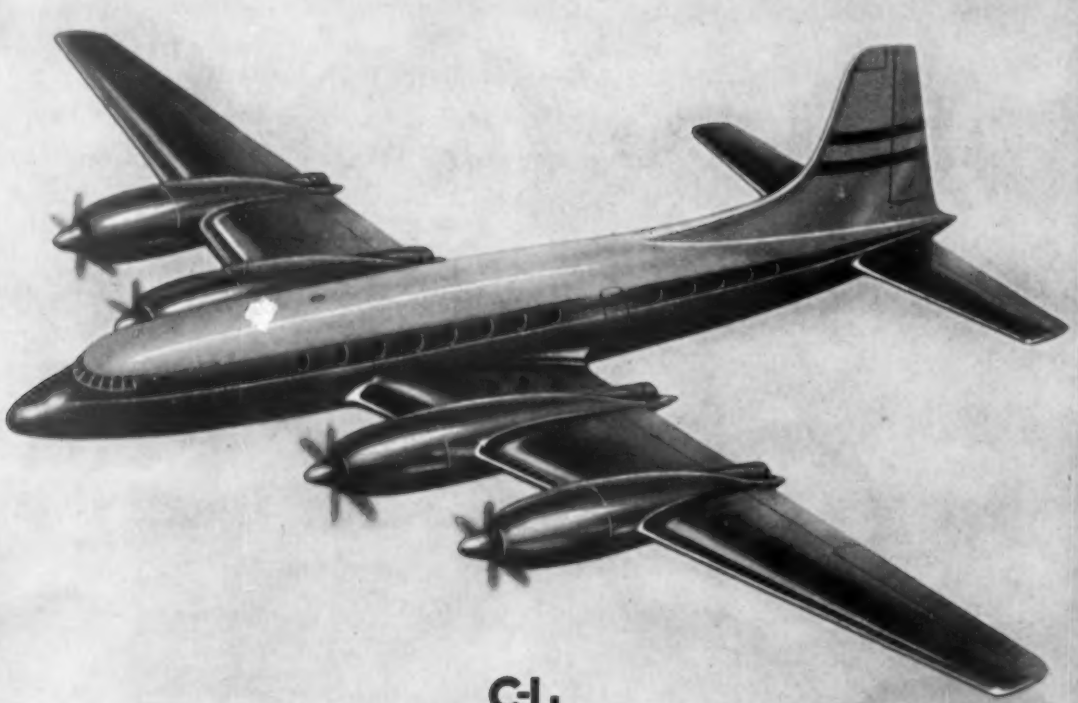

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FARNBOROUGH REVIEWED . . .

turboprops inactive—an expression of pilot-faith in this new and promising power-unit.

The Pembroke and Prince Series V differ only in minor detail, and the Belgian-marked Pembroke was actually billed under the civil designation on Thursday. Loaded to its maximum permitted a.u.w. of 12,500 lb, it climbed away, flew past, made a simulated approach and overshot—all on the 550 h.p. delivered by one of its Alvis Leonides radials. There was a stoic rearward-facing passenger aboard the A.O.P.9, demonstrated on Tuesday and Wednesday in a series of 100 yd take-offs and landings and violent steep turns showing the new Auster's real ability to extract itself without effort from the sort of trouble invited by Army spotters flying low over hostile lines. Thursday's audience saw another Auster product—the Aiglet Trainer J8L—receive the full Porteous treatment . . . stall turns, loops, flick rolls, half-rolls and "avalanches," all perfectly placed and immaculately performed.

No capers were cut by the Heron 2, looking smart in the red-and-white of Turkish Airlines; but then nothing more than a swift, smooth circuit can be expected of an airliner, particularly one which has rewarded operators with economy and reliability and its makers with an expanding order-book. A brochure phrase came to life when the Beaver 2 reached the take-off point—six genuine "fully armed men" dashed to the runway, skidded briefly on hobnail boots and piled aboard; and the Beaver's subsequent take-off and climb belied its heavy load. The cooling breeze which blew up the runway on Thursday made the Prestwick Pioneer's performance more startling than ever: its exit was all but helicopter-like and the landing run took less than 50 yd. The fourth member of this single-engined circus was the Burmese Provost 53, armed with six R.P.s which, it was evident, impeded little its aerobatic performance.

With a silver-helmeted crew of two, the Gannet A.S.1 impressed by its speed during a single-Mamba run with weapons-bay wide open. Its stablemate, the new Gannet T.2, was later permitted a solo spot in the programme; after starting its second Mamba and straightening its wings on the runway, it performed with dexterity remarkable for so tubby a craft. Twin streams of fuel were seen to emerge briefly from the wings during one slow roll.

The Balliol is a familiar shape at Farnborough, but the appearance of a plum-coloured civil demonstrator acted as a reminder that Boulton Paul are offering this Merlin-powered trainer to overseas air forces. Some 3,600 lb thrust from the tip-mounted Soars, instead of twice that total from the cut-back Derwent 8s, propelled Rolls-Royce's latest test-bed Meteor at a cracking pace, and both the Olympus-Canberra and the Sapphire-Canberra went through their now-familiar routine of near-vertical climb after take-off. Each left the ground shaking beneath unseen blasts of ear-splitting sound, and it was difficult to judge which had the faster rate of ascent. The quick pick-up of the twin-spool Bristol turbojet was vividly demonstrated during one fly-past by successive and violent movements of the Olympus-Canberra's power levers—from idling to full thrust; trim-changes appeared to be comparatively slight. Even without special power-units, however, standard production Canberras have an exceptional take-off and climb performance—as shown by the gleaming silver P.R.7 which preceded the test-beds. It rolled as it flew past with camera-doors open and then joined the circuit for a landing with both dive-brakes and flaps extended.

Both the Hawker fighters now in production—the Sea Hawk F.B.3 and Hunter F.1—appeared in the same circus, emphasizing their common ancestry as well as differences in performance and configuration. The Hunter's virtually silent approach (for a period of inverted flight followed by a sequence of rapid rolls) contrasted with a noisy, rather protracted take-off; good low-speed control was indicated by its long hold-off and silky touch-down.

Though it played an indirect part in the show by transporting privileged guests to and from the South Bank, the Westland S-51 was absent from this year's helicopter circus. First off was the Bristol 171 Sycamore 4, which, though an engaging performer in its own right, was viewed mainly as a foil to the larger, twin-rotor "173." A Mk 2 without stub wings, this machine is virtually a prototype of the 100 ordered—principally for anti-submarine service—for the Fleet Air Arm and R.A.F. After circling at medium speed, with rotors flailing and the sun glinting on its polished tube of a fuselage, the 173 settled nose-high over the runway, backed steadily away and then crabbed off to its parking position. Next, like a pair of bright-hued insects flirting in the sunlight, came Saunders-Roe's Skeeter 5 and Skeeter 6. Their antics bespoke extreme manœuvrability and good control-response, plus willingness to hover soberly when occasion demands—qualities all vital in a light general-purpose rotorplane.

The first of the individual demonstrations featured the N.F.14, which is regarded—rightly it appeared—as the fastest Meteor yet built. Ventral and under-wing tanks detracted little from its aerobatic liveliness and extreme slenderness of form. Short's black and silver Sherpa was originally projected as a glider test-bed for the aero-isoclinic wing, the two Blackburn-Turboméca Palas turbojets being added almost as a second thought; take-off performance is not of primary importance, and the Sherpa did, in fact, seem to require every ounce of 700 lb thrust to become airborne. Once in the air, however, its unique wing and moving-tip control surfaces appeared most effective. It approached slowly with nose well up and Brooke-Smith deliberately held off for two or three hundred yards before touching down in order to demonstrate the ample and positive lateral control.

The first part of the Jet Provost's performance showed its

S/L. Hazelden took the second Victor for its maiden flight at Radlett on Saturday morning and presented it at Farnborough in the afternoon. "Flight" photograph

FARNBOROUGH REVIEWED . . .

fighter-like manœuvrability, but 3½ turns of spin and a sideslip approach to a short landing were an effective reminder of its rôle as a basic trainer. In keeping with current fashion, the Canberra B.8 should perhaps be regarded as a "weapons system"; we preferred, however, to think of its demonstration at Farnborough simply as the product of a fine aeroplane and a superb pilot. Superb was the word for Beamont's handling on the guest days, when he sent the glossy black bomber through a continuous sequence of curves in all planes, a visual thrill heightened by the aural effect of his characteristically decisive use of power. The accent here was on manœuvrability and acceleration rather than speed, and in fact the low speed at which the B.8 made its steep climbing turn into the circuit with wheels unfolding was one of the most notable features of its repertoire.

For sheer slow-flying ability the Seamew excelled among the purely military fixed-wing machines. One of these functional-looking anti-submarine aircraft loitered at an estimated 60 kt, while a companion buzzed past at a more usual pace. The Seamew also impressed by its 80 deg banks with weapons-bay open, and by the ability of its slender long-travel oleo legs to convert a hefty rate of descent into a gentle three-point touchdown.

The Folland Gnat is designed as a modern day fighter in every respect but size and cost, and the Farnborough debut of its prototype, the graceful blue Midge, made the formula seem very convincing. The length of its take-off run was perhaps a reminder that the Midge depends on a Viper of only 1,640 lb thrust (the Gnat will have an Orpheus of three times that rating), but otherwise the Midge belied its comparatively low power. A full range of aerobatics showed the effectiveness of controls; and with the aid of wheel-door/speed-brakes and a 180 deg steep turn, S/L. Tennant slowed his little aircraft from some 500 kt to less than 200 in about one and a half lengths of the airfield. The Midge has no flaps and makes a nose-high, fairly steep approach.

Steepness of bank—on occasions inclining past the vertical—was a notable aspect of the Vulcan's appearance this year. The smoothness with which this massive white triangle sailed round the airfield bore out reports that it is remarkably straightforward to handle. Span-wise, as an American visitor might have remarked, the smallest aircraft in the show was the Fairey Delta, which also had the distinction of rolling faster than anything seen previously at Farnborough.

Seen for the first time was the attractive form of Supermarine's Type 525, an experimental fighter with two Avons exhausting below and on either side of the sharply swept tail. On Tuesday the 525 provided the first instance of a supersonic bang timed to coincide with the appearance of the aircraft within the airfield boundary, and the form of shock waves was fleetingly illuminated by sheets of condensation from the wings as the cream-painted fighter sped soundlessly across the field. Flown by Lithgow, the 525 was followed by a Swift F.4 in the experienced hands of Dave Morgan, whose supersonic dive introduced a sequence of fast level runs and rolls joined tightly together by g-provoking turns.

The searing roar generated on take-off by the Valiant B.2, and its subsequent high-speed runs in each direction, suggested that this menacing black monster is equipped with a particularly powerful brand of Avon. Though it is reported to have flown past with plenty of thrust in hand, its speed was estimated to be well over 500 m.p.h. As recorded photographically on p. 437, the Valiant's low run offered an especially striking spectacle on the first public day. As the big machine swept in and across (and beneath a particularly low, black and moist-looking cloud), a sharp, dark vapour-envelope seemed to spring up instantaneously and lock on to the aircraft as it rushed past the crowds. At least one observer's aerodynamical upbringing came to the fore in a delighted comment on this visual presentation of the pressure distribution across the wing. . . .

A smooth, if subsonic, demonstration of a Sapphire-powered Hunter F.2 made an appropriate prelude to Neville Duke's scorching arrival from Dunsfold in the "special" Hunter 6. A rapid series of loud reports, a silent green arrow flashing past the enclosures, and the scream of tortured air followed the Hunter's disappearance into cloud 10,000ft above . . . yet somehow, thanks to masterly flying, the demonstration which followed was not an anti-climax. Another fast run gave place to a series of high-speed rolls above the field; then a superb slow roll along the entire length of the runway; and one final burst at 700 plus before the new Hunter returned to its home airfield.

A heartening sight was the first appearance at Farnborough of a production Comet 2 and the prototype Comet 3. The Series 3's docile circuit performance indicated that handling has not suffered from the additional fuselage length. The new centre-section flap, incidentally, was not used during the display; even so, the landing matched the take-off in its remarkable brevity.

Though officially scheduled to fly only on transport day, the first production Britannia 100 arrived on Wednesday in time for the programme to end on a pacific note—the amazingly subdued sound of four Proteus 705s. The Britannia's landing showed the effectiveness of the D.H. reverse-pitch steel airscrews.

De Havilland's "navalized" 110 produced its bangs off-stage, as it were, resuming its performance at low level after an interval. This included a vigorous overshoot with "everything down," a protracted period of inverted flight, and a carrier-type curving approach.

Ten Sapphires roared as five Javelins climbed steeply away from the airfield to join into the first formation of delta-winged fighters seen in this or any other country. The steadiness with which they kept station said much for the Javelin's handling qualities, and great encouragement was drawn from the thought that here, in production form and battle trim, were examples of the most advanced all-weather military aircraft in the world. When the formation had passed, one Javelin broke away for a solo demonstration of fast and low runs, sky-consuming loops, fast rolls and a smooth four-point roll—an exhilarating conclusion to the 15th S.B.A.C. Flying Display. After Tuesday a solo performer kept the Gloster flag flying, the remaining Javelins being kept in reserve or recalled on more urgent business.

THE AIRCRAFT

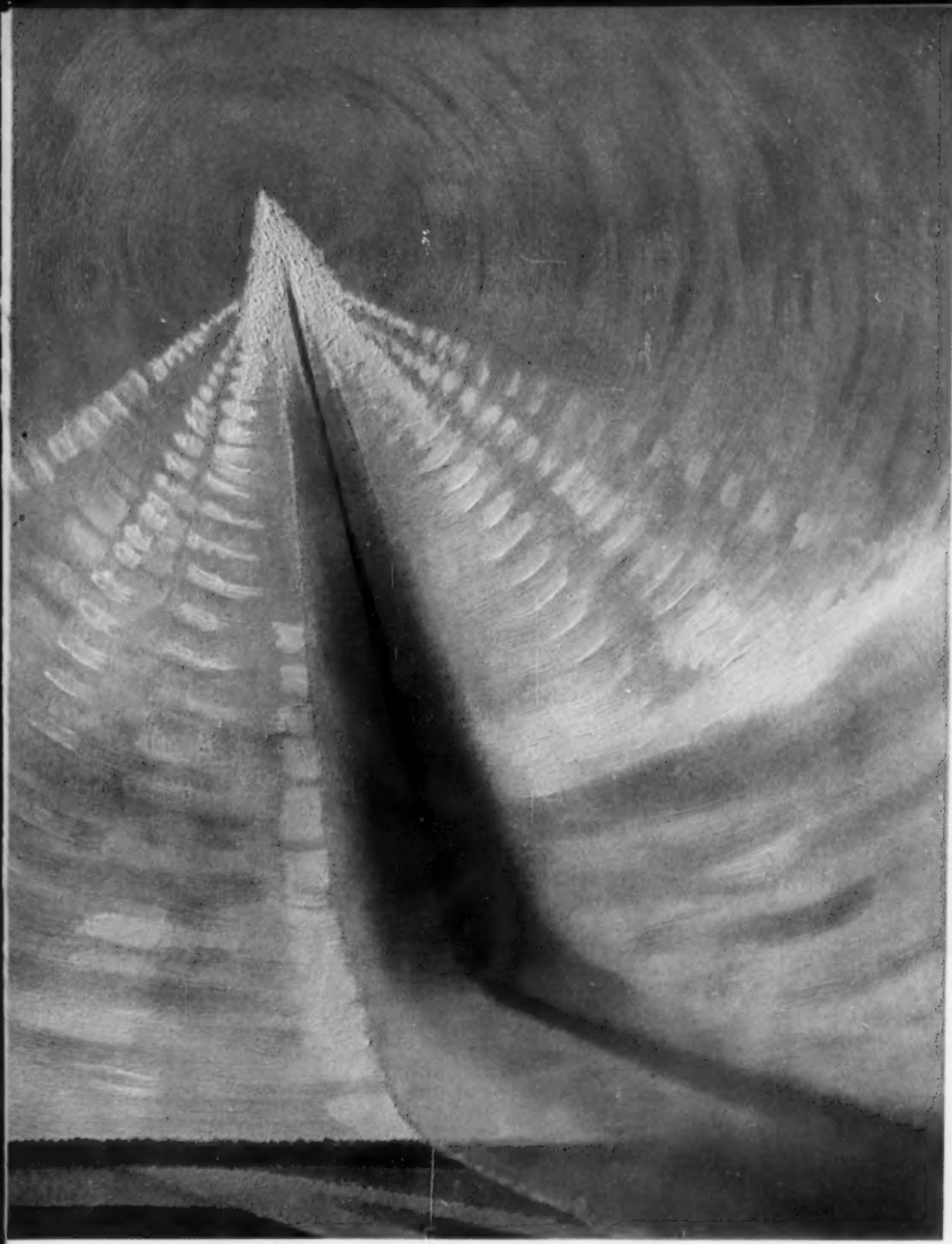
MILITARY

IN the deplorable absence of the English Electric P.1 supersonic intercepter, the Folland Midge (Gnat prototype) was the only wholly new fighter at Farnborough (for the Supermarine 525 is based on the straight-wing types 508/529). Interest in the private venture Midge was heightened by the news that senior NATO officials and officers of the U.S.A.F. had been scrutinizing the machine in detail, and that on Wednesday they were visiting Bristol to discuss the Orpheus turbojet, which will be the standard power plant of the Gnat.

It is Folland's conviction that a small high-performance aircraft can be built, at a fraction of the cost of a conventional fighter, to perform "most of the operations which might be required of any single-seat day fighter." They contend that the light fighter could fulfil an important role in a struggle for air superiority, where numbers might be paramount, and in bomber destruction, "under conditions where extensive search and other equipment is not necessary." Without compromising flying performance, they add, close attention has been paid to tactical requirements, and the requisite margin of strength and load capacity have been provided for ground-support work. The high wing is considered ideal for the carriage of external stores.

S/L. Tennant, Folland's test pilot, reports that the Midge has a viceless stall, and that it can be kept straight by either rudder or control column during the approach to a stall. There is, too, ample stall warning. The company themselves set great store by the flying tailplane, wherein the elevator acts as a servo

Baby in blue: the Folland Midge light-fighter prototype.



This painting by Roy Nockolds, the first of a series of abstract designs specially commissioned by Armstrong Siddeley, gives something of the feeling of the immense thrust developed by the Sapphire turbojet propelling a fighting aircraft to its operational height in a matter of minutes . . . an essential requirement for the modern military aeroplane.

SAPPHIRE

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★ The Sapphire is manufactured under licence by the Wright Aeronautical Division of the Curtiss-Wright Corporation in the U.S.A., where it is known as the Wright J.65.

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THE GLOSTER JAVELIN *all-weather fighter*

★ **THE REPUBLIC F.84F** (*Thunderstreak*) *fighter*

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★ **THE MARTIN B57** (*Canberra*) *bomber*

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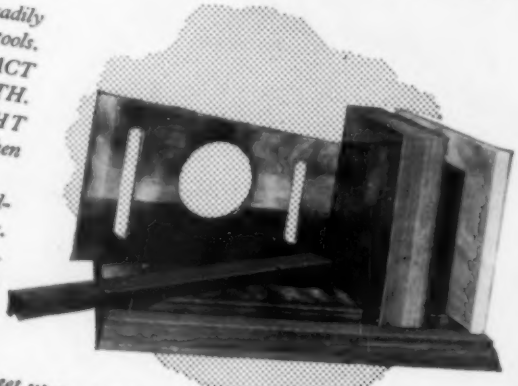

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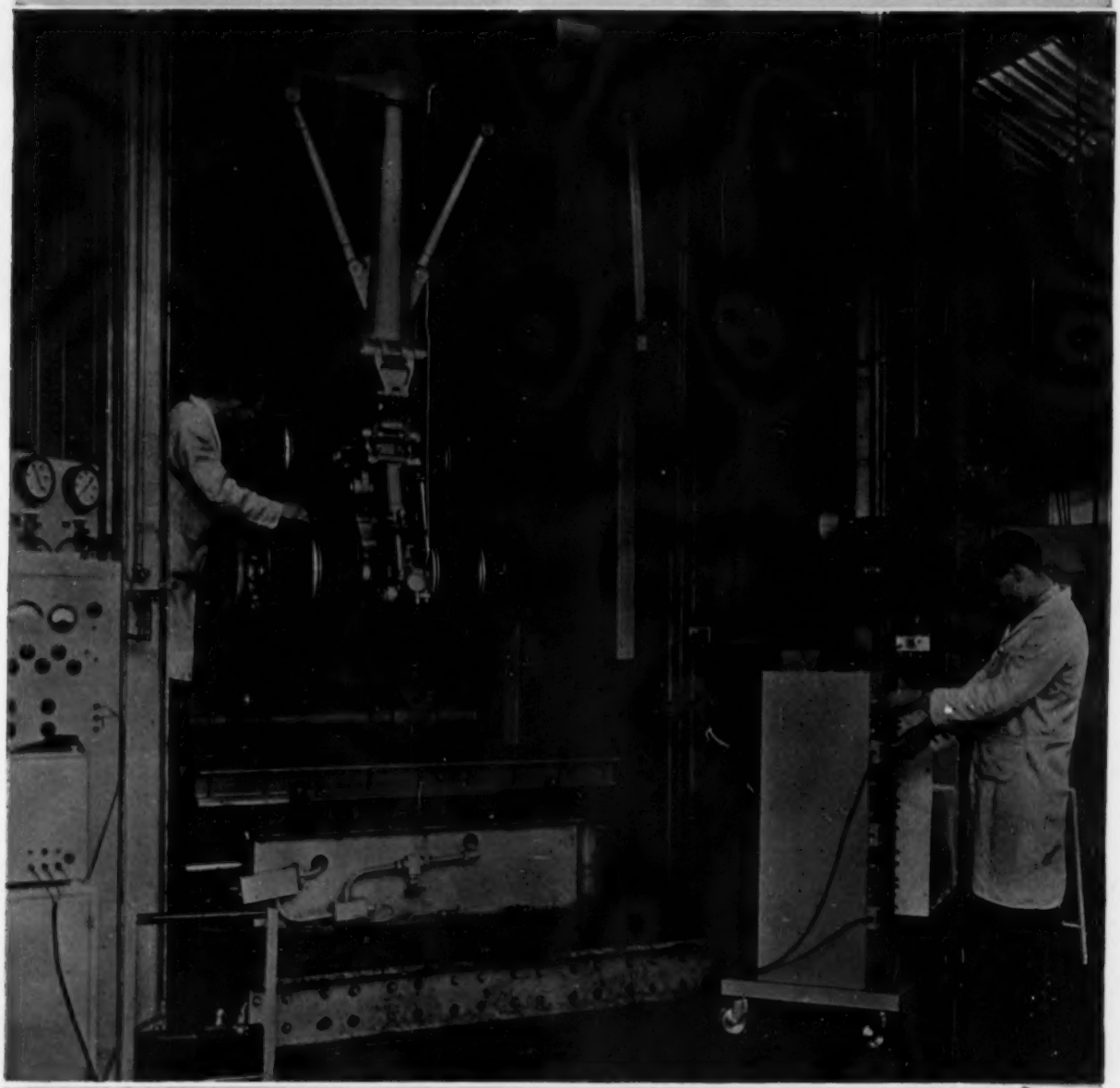

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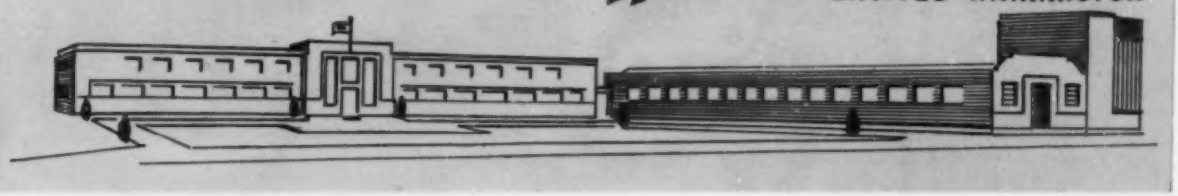

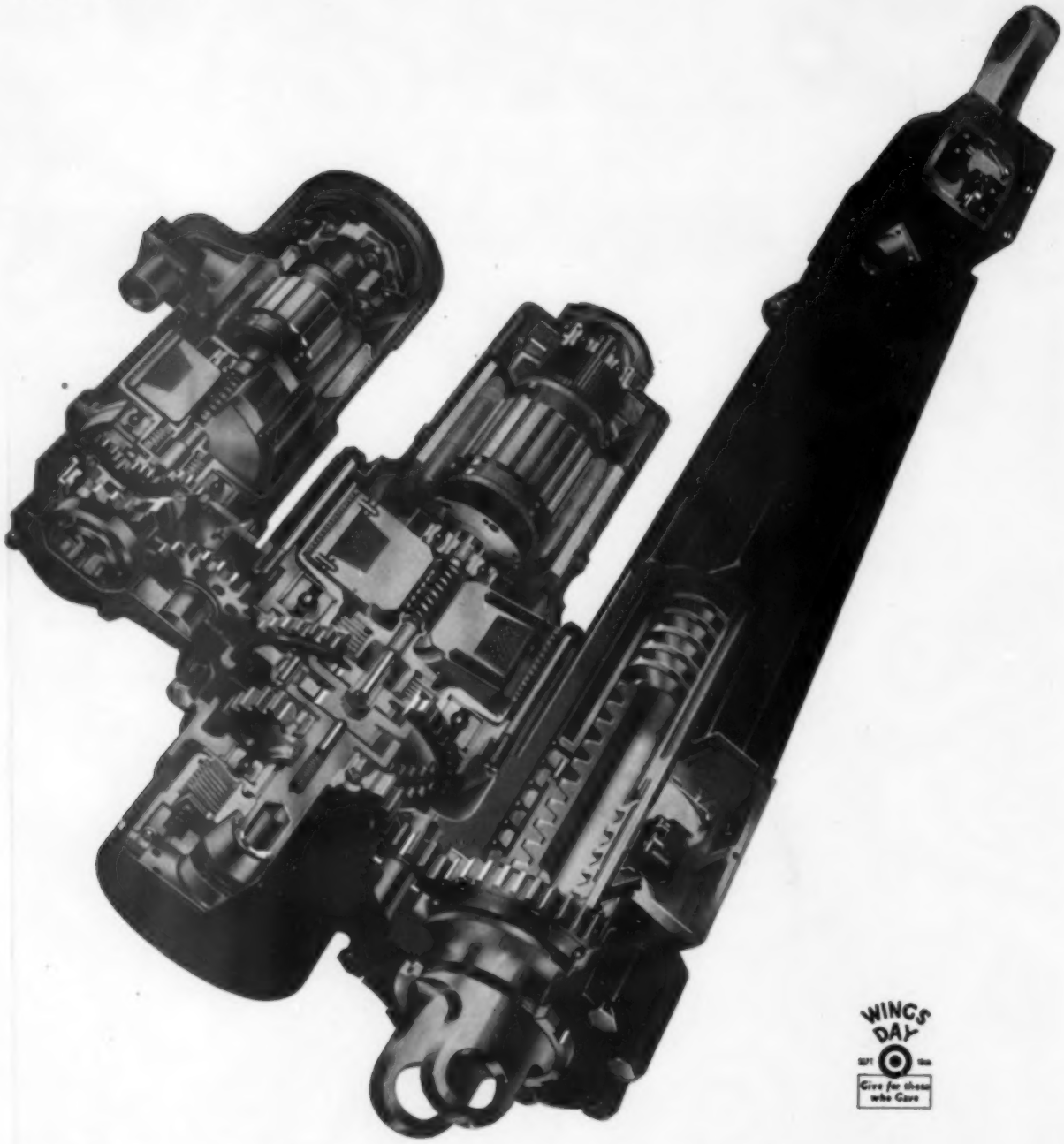

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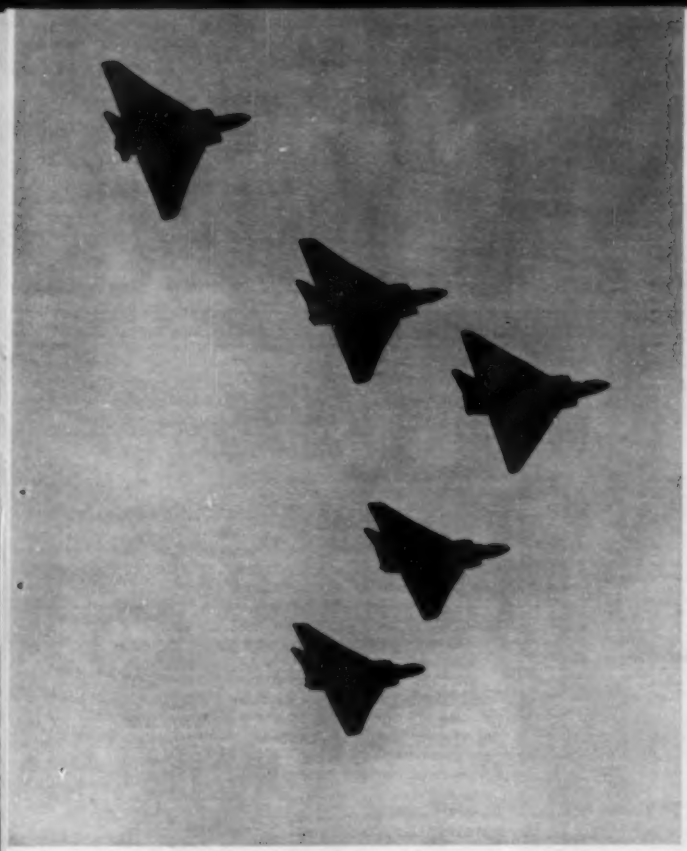
(Left) The five Javelins, led by WT827, with the original wing form. (Below) The Supermarine 525, with air brakes extended.



FARNBOROUGH REVIEWED . . .

and brings about changes in the setting of the tailplane appropriate to the prevailing condition of flight. Tailplane movement is effected hydraulically, and any stick forces remaining can be trimmed out by an electric motor, forming part of the tailplane power unit and worked by a button on the control column. The inset power-operated ailerons of the Gnat will, it is expected, give an exceptionally high rate of roll—at least 200 deg a second—over a wide range of speed and height.

As shown at Farnborough, the Midge carries a good deal of test instrumentation, but the basic instrument layout conforms to one of the patterns on trial for NATO standardization.

In the ground-support role, the Gnat will be able to carry a formidable war load, including two 500 lb H.E. or napalm bombs, or twelve 3in rocket projectiles. Range under these conditions will be "adequate for all normal tactical operations." Equipment, in addition to two 30 mm Aden guns, includes a lightweight ejector seat, VHF radio and standby, D.M.E., and provision for radar ranging.

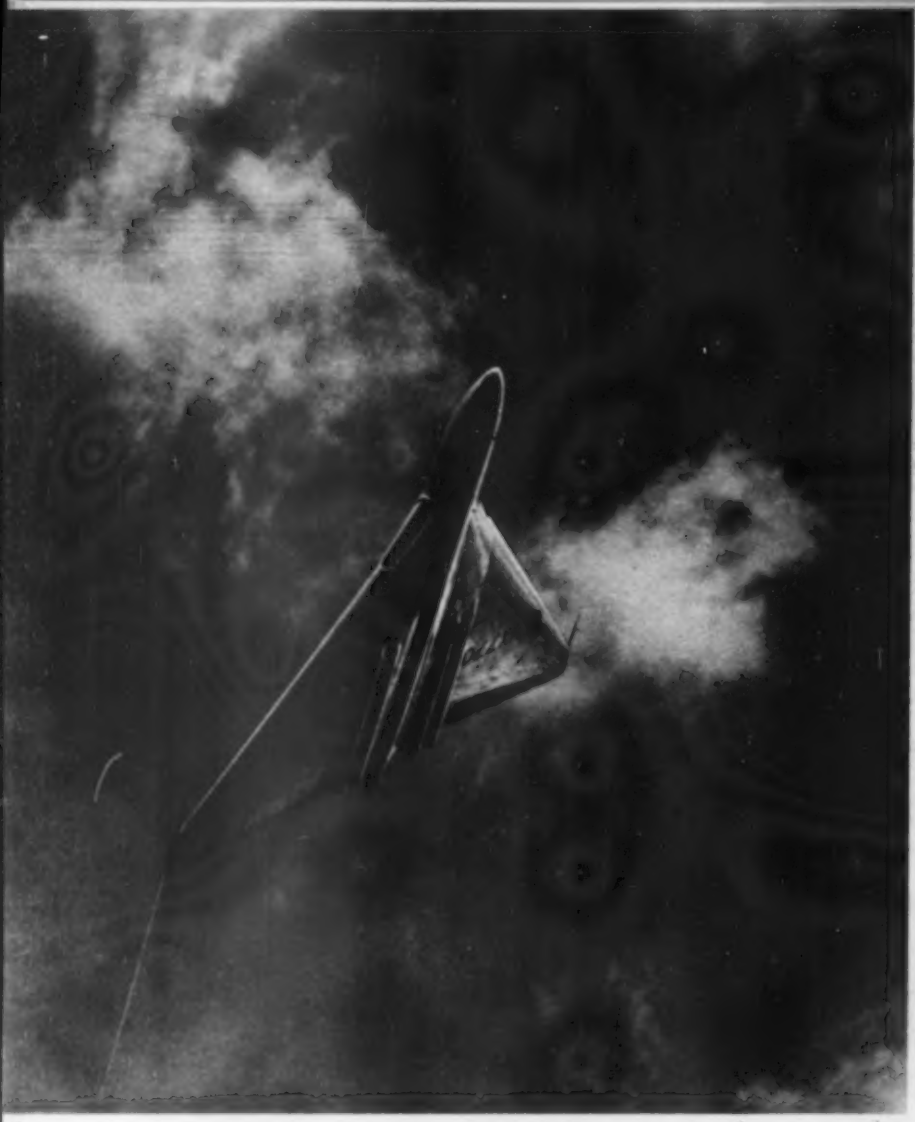
As compared with the so-called "standard" fighter, Gnat

Fastest roller of all: Fairey's F.D.1 fighter-research delta.

W/C. Beamont beginning his superb demonstration of the Canberra B.8.

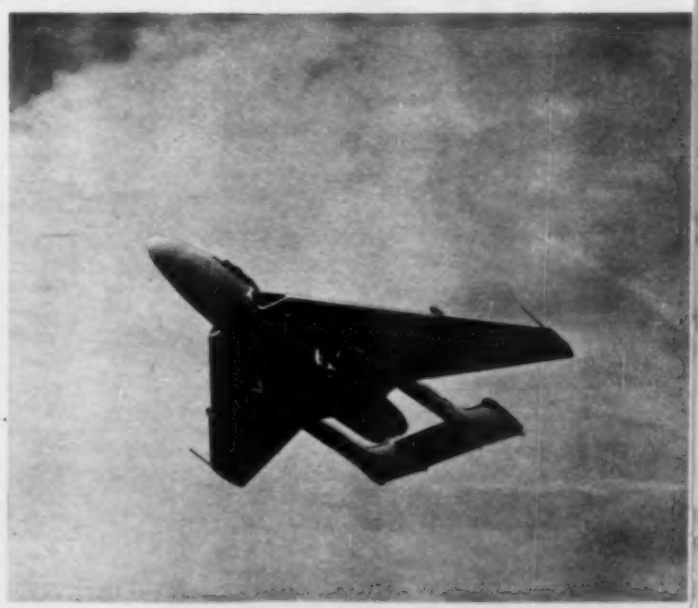
FARNBOROUGH REVIEWED . . .

tooling time, it is claimed, is halved, and 25, instead of 5, could be built in the same number of airframe man-hours. Structurally, of course, the Midge is extremely simple, the wing being built in one piece and attached to the fuselage by bolts at four main points. Being small, say the makers, the wing could be given the strength and stiffness needed for supersonic flight without resort to complex structures or heavy-gauge metal. The absence of guns, undercarriage and tanks is a further factor in its simplification. So far as can be gathered, however, the structure is essentially orthodox, whereas novel forms of construction, which might be applicable to the light fighter, are under development by other makers. It was disclosed by Bristols, for example, that an experimental wing of 10.5ft span, together with representative fuselage sections, has been built by them of asbestos-phenolic material. The wing is designed for flight at high subsonic speeds and is estimated to be 10 per cent more efficient on a strength/weight basis than an equivalent aluminium-alloy wing. Production costs, moreover, would be far lower. The unit has been designed for a high output rate, and it would be possible, with one set of tools, to produce a complete wing every two hours. Avros, who themselves have plans for a light fighter/bomber, exemplified at Farnborough their development of sandwich construction, in which a very light honeycomb core is sandwiched between thin sheet panels.



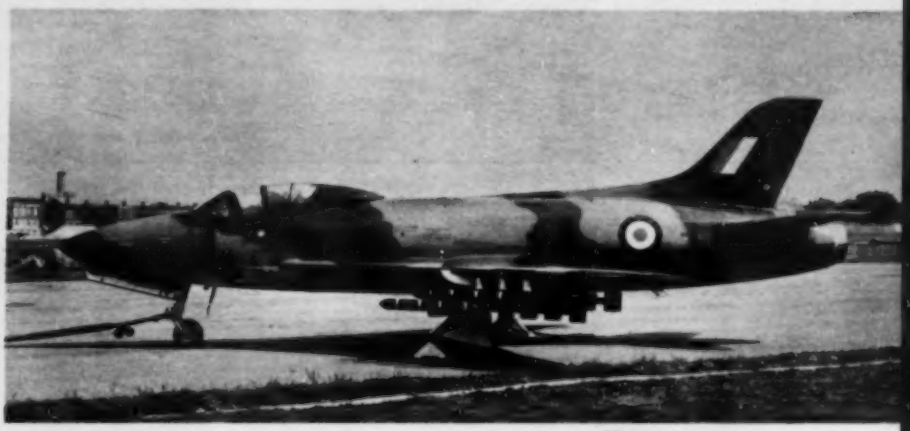
(Left) A single tip-trail marks the sweeping passage of the Avro Vulcan. At lower left the Percival Jet Provost and Armstrong Whitworth Meteor N.F.14 get under way, and immediately below the D.H.110 ascends under Avon urge.

"Flight" photographs



"Flight" photograph

(Above) Landing with flaps and air-brakes in operation is Gloster Javelin WT836; note the gun-ports in the wing. On the right is a Swift F.4, armed for ground attack, and last are the two Short Seamews, respectively the first and second prototypes.



"Flight" photograph

The antithesis of the Midge is, of course, the Supermarine Type 525, powered with two Rolls-Royce Avons, and having "all mod. cons." The salient features of this machine—second stage in an experimental programme for the development of a new Naval intercepter—are already familiar, but not until the flying demonstration did it become known that the wing has "droop-snoot" leading edges, and that air-brake surfaces are attached to the lower portions of the turbojet housings. The 525 would seem to have the makings of a formidable strike aircraft—an eventual replacement for the turboprop Westland Wyvern—and in this connection it has been officially disclosed that the development on order will be able to carry the atomic bomb.

The speed of Neville Duke's fly-past in the Hawker Hunter F.6 was at once gratifying and exasperating, for, although it was proof that the Hunter is now on the very threshold of supersonic speed in level flight, it allowed little in the way of detailed examination. That the external form of air brake is retained, however, is certain. Overseas orders for Hunters, incidentally, have grown, in little more than a year, to £121 million, far surpassing (say the makers) "the best achieved by any other British aircraft or any other single British product." The amount includes about £65 million in American off-shore NATO contracts. Other air forces are known to be interested, and we have it on Hawker's authority that "it is not over-optimistic to suppose that more orders will be coming along." The Blackpool factory is acknowledged as Europe's biggest fighter production unit; other Hunter plants are Hawker's at Kingston, and Armstrong Whitworth's at Coventry, and Hunter components from any of these are interchangeable.

Bristols made it known that one of their 100-gallon drop tanks has been flown on the Hunter at supersonic speeds.

As for the Swift, all that can usefully be added to our notes of last week are these few facts: the cockpit has a cold-air unit for use at low altitudes and in hot climates; there is provision for an external drop tank beneath the fuselage; and pressure-refuelling is standard. All five marks of

Symmetry in perspective: The most impressive study of the Comet 3 to date, showing especially the installation of the Rolls-Royce Avons, the "pinion" wing tanks, and the great length of nose. In the flying display the take-off run of this aircraft was astonishly short.

FARNBOROUGH REVIEWED . . .

"FLIGHT" Photographs

The aero-isoclinic-winged Short Sherpa peels off.

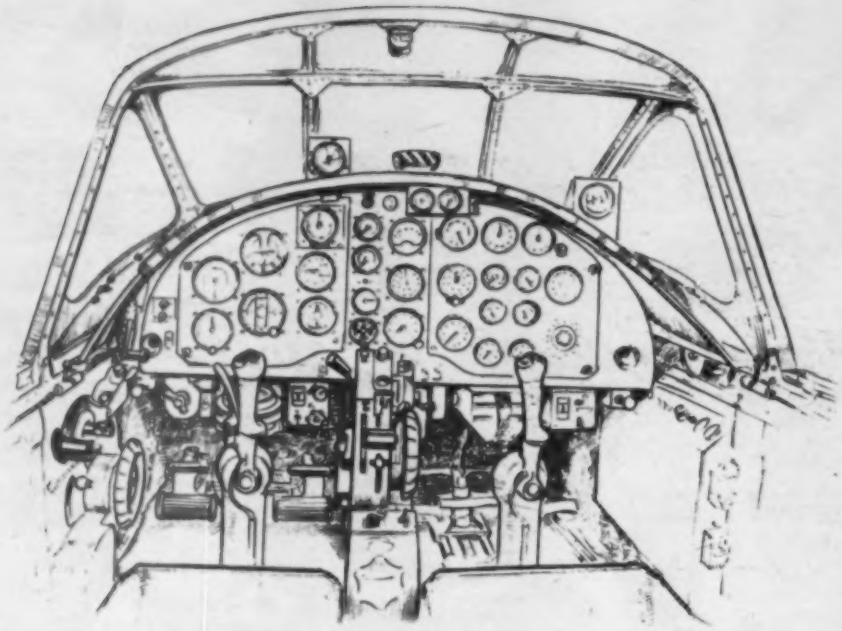
The Fairey Firefly 8 radio-controlled drone, also used for missile observation.

FLIGHT, 17 *September* 1954
444-445

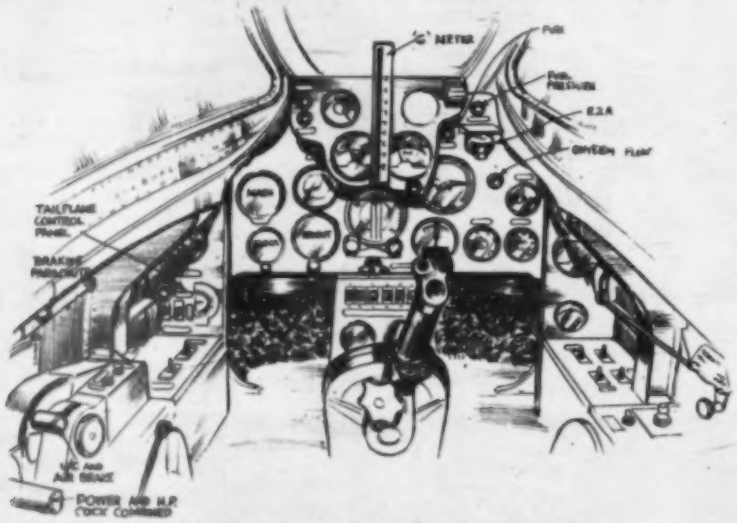
The Hunting Percival Survey Pembroke—destined for operation in Belgium—goes gay.

(Above) A lively impression of the show's Tom Thumb—the Folland Midge, showing the relatively great breadth of the fuselage.

(Left) The Swift F.3 noses in. Below, in halcyon weather, and wearing full Naval colours, is seen the second Short Seamew.



The Jet Provost cockpit has test equipment, but is essentially standard.



Above, the cockpit of the Midge (the actual aircraft, and not that on the Folland stand). The test panel at top centre will later be replaced by a gunsight. Below are the Bristol 173 and 171 helicopters. The 173, which demonstrated last year with wings, is being developed as a wingless anti-submarine aircraft for the Fleet Air Arm.

FARNBOROUGH REVIEWED . . .

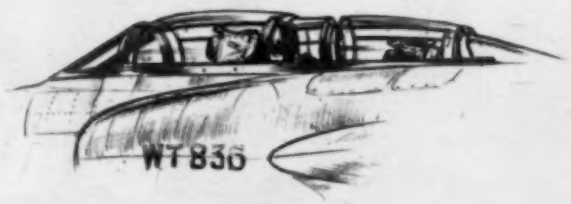
Swift, it is affirmed, are capable of diving at supersonic speed.

Perhaps the most heartening feature of the whole display was the formation of five Gloster Javelin FAW.1 all-weather fighters—especially so as it is known that Javelin production is ahead of schedule. The prototypes and first production aircraft have logged many hundreds of hours, including long periods at operational height. Mach 1 has frequently been surpassed in the dive. All production aircraft have the revised wing plan-form (the object of which is primarily to give better fineness ratio over the ailerons) and a clear-view canopy.

A model of the D.H.110 with folding wings for Naval service was on view, and de Havillands officially announced that all the latest marks of Venom—N.F.3, F.B.4 and Sea Venom N.F.21—have power-operated ailerons as standard equipment. This innovation is claimed to confer a much improved rate of roll and manœuvrability at higher Mach numbers.

The intruder, or "interdictor," aircraft must have the attributes of both a fighter and a bomber; and the Canberra B.8, introduced at Farnborough this year, is the pre-eminent example. It was statically parked with bombs—including a 1,000 lb medium-case and a 1,000 lb Mk 8—four 20-mm guns, each with a huge "tank" holding something like 500 rounds, and an F.24 high-level camera. An Alvis low loader is used to facilitate gun-pack removal. Presumably 30-mm guns could be substituted for the present gun armament, though at the expense of ammunition supply.

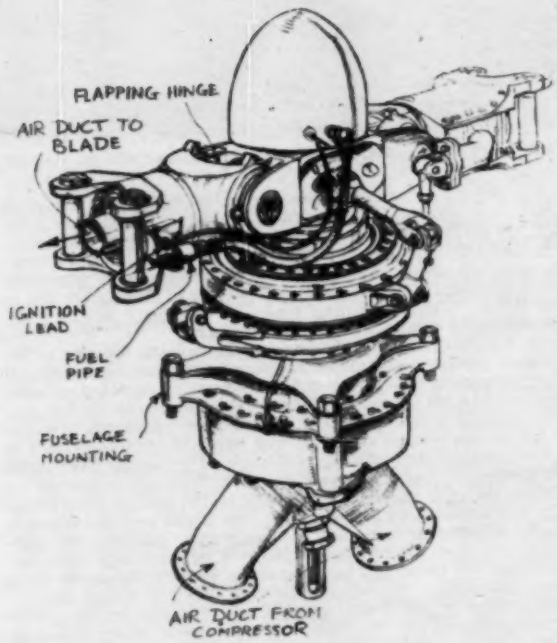
Significant in the bomber demonstrations was the spectacle of the Avro Vulcan over the vertical, and the extremely fast run—estimated at 480-500 m.p.h.—by the Vickers-Armstrongs Valiant B.2. A "one-off," the B.2 is evidently a special-purpose aircraft, and the airframe has probably been built to higher factors than that of the production-type B.1, no example of which appeared. A photographic-reconnaissance variant of the Valiant is undergoing development. Although it is now generally known that production Valiants are flown from Vickers' airfield at Brook-



The upper of these sketches shows the cockpit enclosure of the production Javelin. Each canopy slides to the rear independently and incorporates de-mister bars. On the right are seen the entry arrangements on the Avro Vulcan.

The de Havilland Comet 2 gets going.

"Flight" photographs and sketches



A key exhibit on the Fairey stand is the rotor head of the Rotodyne, features of which are brought out in this sketch. Below, the Scottish Aviation Prestwick Pioneer shows what can be done with slots, flaps and the power of an Alvis Leonides. A projected development—the Mk 4—was shown in the static exhibition in model form.

lands, and that they sometimes get off in under 600 yd in light wind, it is not, we suspect, generally realized that it was from Brooklands that the Valiant's famous ancestor, the Vimy, was tested.

The Fairey Gannet A.S.1 was shown in company with typical stores, including a torpedo of unfamiliar pattern, sonobuoys, rescue flares, 1,000 lb bombs, rescue containers, one very large mine, two smaller mines, and rocket projectiles. No indication of the Short Seamew's service load was given, though the useful dimensions of the bomb bay were occasionally evident in the air.

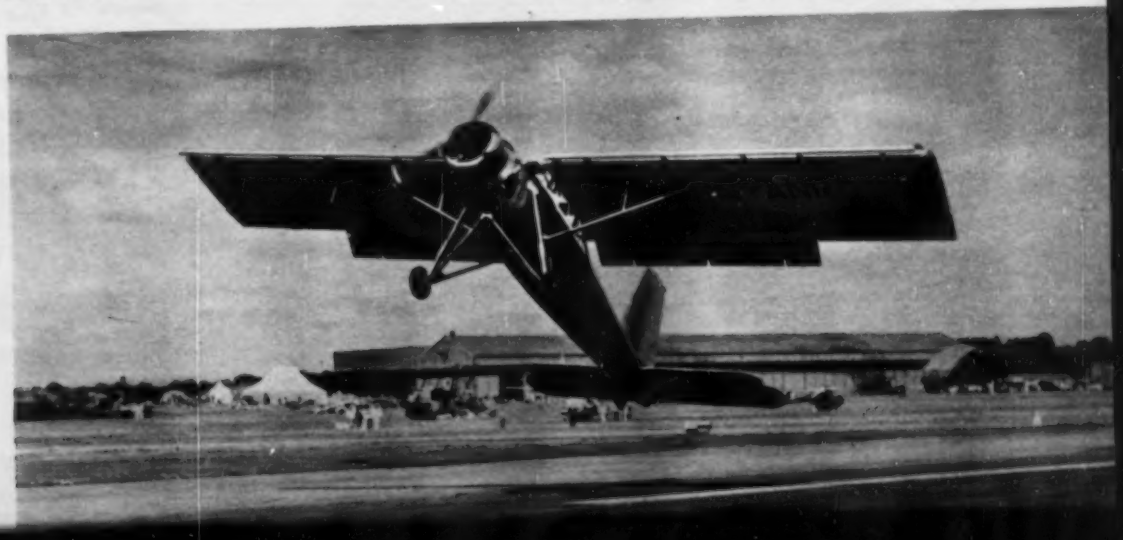
Among the trainers, the Hunting Percival Jet Provost was quite outstanding. A machine of somewhat similar character, and likewise powered by a Viper, has been designed by Boulton Paul, and was shown in model form, designated P.114.

HELICOPTERS

IN the field of rotorplanes the almost-complete Westland-Sikorsky S-55 in the bright, white colour scheme of B.E.A. pointed to the next step in scheduled British helicopter services. An indication of a strong future possibility—no more at present—was the model of the American Sikorsky company's S-56, also in B.E.A. colours, on the Westland stand. Bristol's 173 appeared this year in military guise, without stub wings. The company's order for approximately 100 twin-engined helicopters for Naval and Air Force use is certain to provide a valuable basis for further twin-engine development for civil machines.

Current data on the Rotodyne available from the Fairey company's stand gave another glimpse into the near future. Assuming a 130 kt cruising speed and three-minute allowance for take-off and landing, the following are some typical journey times between city centres; London-Paris, 88 min; London-Amsterdam, 92 min; London-Brussels, 84 min; London-Ostend, 57 min; London-Liverpool, 75 min; and Manchester-Glasgow, 75 min. With a cabin space of 3,300 cu/ft, the Rotodyne carries a maximum payload of 11,000 lb. The 90ft-diameter four-blade rotor is driven by Fairey tip-mounted pressure-jet units, and two Napier Eland turboprops are used for forward flight. Still-air range is some 250 n.m.: over a stage length of 100 n.m. the direct operating cost is estimated at 27 pence per ton-mile.

Both current types of Saunders-Roe Skeeter, the Mk 5 and the Mk 6, were shown at Farnborough. Powered by a Gipsy



The first production-type Bristol Britannia 100 for B.O.A.C.—registered G-ANBA—which made its first appearance at Farnborough on September 8th.

As the D.H. Beaver concludes its show the Fairey Gannet taxis out.

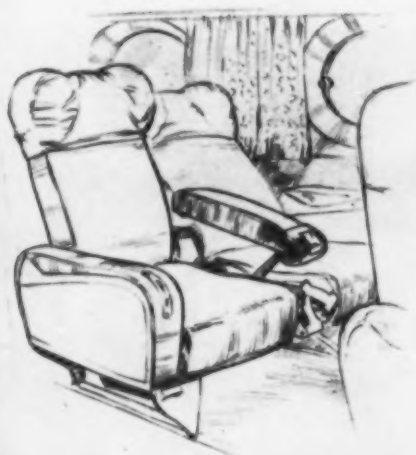
FARNBOROUGH REVIEWED . . .

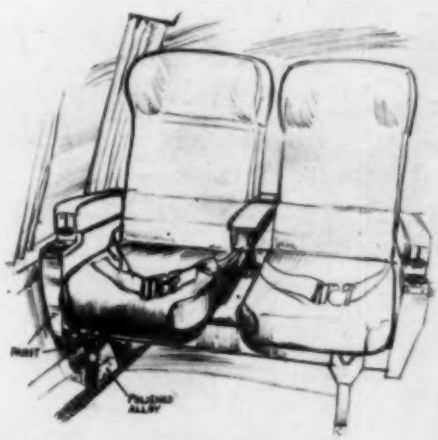
Major 30 engine of maximum continuous power 183 b.h.p. at 2,500 r.p.m., the Mk 6 has its all-up weight increased from 2,100 to 2,200 lb. This has resulted in an 80-lb increase in the disposable load. Dimensions and other main features of the two types are identical, but the increased power has improved the maximum cruising speed from 76 to 88 kt and the rate of climb from 880 to 940 ft/min. The maximum range of the Mk 6 is 225 n.m., corresponding to an endurance of 4.4 hours.

To the Hunting Percival company, the simplest solution of the tip drive problem in helicopters appeared to be the use of a special gas producer in which the entire products of combustion were directed through the rotor blades and out through jets at the tips. This method is used on the P.74 helicopter prototype, a model of which was seen in the exhibition tent (the prototype itself is due to fly about the middle of next year). Two Napier Oryx turbo gas generators, located beneath the cabin floor, are connected by ducting on each side of the fuselage to the hollow rotor head. The gas produced by the two units passes into each blade and is discharged through nozzles at the blade tips. An auxiliary gearbox driven from the rotor-shaft provides electrical and other services; on the prototype machine these include the drive for a small tail rotor. Advantages claimed for this design are the compactness of the overall configuration (no anti-torque device is required) and the simplicity of the gas drive, which avoids all mechanical couplings. The development of this type is being followed with much interest at the present time.

Left to right, below, are the cockpit of the Saunders-Roe Skeeter Mk 6 helicopter; de Havilland chairs for the Comet Series 3 (these weigh 50 lb the pair and the centre arm-rests can be folded to provide more seating room); and the seats in the T.A.A. 44-seat Viscount.

"Flight" photographs and sketches





The T.A.A. Viscount has a gay colour scheme.

CIVIL TYPES . . .

ONE of the most interesting aspects of the civil-aircraft side of the S.B.A.C. Show was to be studied not on or above the runways, but in the exhibition tent. It lay in the broad problem of finding a Dakota-replacement, and in the progress made by five British firms in this direction. To the continued efforts of Aviation Traders, Handley Page, Hunting Percival, and Scottish Aviation (three of which firms' products were examined in detail last week) was added this year a new contribution by Follands.

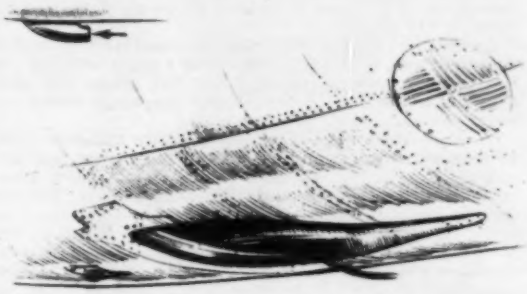
Although the main interest of visitors to the Folland stand was centred on the company's Midge and Gnat, a small model on one of the tables indicated that Folland designers were also thinking of types other than lightweight fighters. The model was of an 88ft span high-wing, twin-boom "utility transport," with a fixed undercarriage and rear loading-doors. Intended primarily as a freighter, this machine could also be used for passenger transport, particularly in undeveloped countries.

Nothing revolutionary in the way of power plants is envisaged; they would be four Gipsy Queen 30s. Gipsy Queen 70s or unspecified turboprops are given as alternatives, however. The aircraft would carry 2½ tons of freight or 32 passengers in its 1,050-cubic-feet capacity fuselage, and would have an all-up weight of 17,000 lb.

The machine has been designed to meet I.C.A.O. category "A" performance requirements with one engine out, assuming runways of 900 yd (temperate conditions) and 1,400 yd (tropical), and to maintain level flight on three engines up to 7,000ft in tropical summer conditions. Normal cruising speed is 115 kt, maximum cruise 130 kt, and take-off distance to 50ft, 700 yd. It is estimated that the direct operating cost would be 2s per ton-mile on stage-lengths of 200 nautical miles, assuming fuel reserves for V.F.R. conditions.

At twice the all-up weight of the Folland project is the Handley Page H.P.R.3, the first prototype of which is expected by the company to fly next year. Many took the opportunity of inspecting the full-scale fuselage mock-up of this machine on the Handley Page stand in the exhibition tent at Farnborough. A high-wing, four-engined design, the Herald is powered by Alvis Leonides Major piston engines, and can carry up to 36 (first-class) or 44 (tourist-class) passengers, or passengers-plus-freight, or freight only (maximum payload, up to about 300-mile range, is 10,700 lb).

The most economical stage-length for the Herald is estimated to be between 400 and 500 miles when, for a 10,000 lb payload, the direct operating costs per ton-mile should be 15.2 pence (V.F.R.) and 16.6 pence (I.F.R.), calculated on the standard S.B.A.C. method. At a range of 1,500 miles the payload would be 6,500 lb and the direct operating costs 23 pence and 26.7 pence for V.F.R. and I.F.R. conditions respectively.



On the T.A.A. Viscount the air intake is flush, as shown, whereas earlier it was of the scoop type, seen in the smaller sketch above.

Possessing a span of 88ft and a take-off power of 870 b.h.p. from each of the Leonides Majors (730 b.h.p. M.E.T.O.), the Herald is designed to cruise at between 190 and 195 m.p.h. at 50 per cent M.E.T.O. power. Take-off distance to 50ft on all four engines under I.S.A. sea-level conditions is stated to be 576 yd. As a test-bed for the Herald's engines, a Marathon powered by two Leonides Majors (previously the Mamba-Marathon) and to be known as the H.P.R.5, is soon to fly.

Another prototype due to fly next year is the Aviation Traders' Accountant, the ingenious tensioned-skin design powered by two Dart RDa.6 turboprops. The fuselage of the first machine has now been completed, and a second (for pressure testing) is under construction. A 77ft 6in span low-wing aircraft, the Accountant has an initial gross weight of 24,000 and has been designed as a 36-seat general-purpose transport.

Still in the design investigation stage, Hunting Percival's P.87 twin-pusher high-wing 30-seater would have a gross weight of 25,000 lb and a typical cruising speed of 265 m.p.h., and incorporates rear-ramp loading. The model on show at Farnborough last year displayed what transpired to be Napier Oryx engines, but other power units are being evaluated. Direct operating cost of this medium-range machine is put at about 1s per ton-mile.

Smaller than a true Dakota-replacement, the 16-seat Scottish Aviation Twin Pioneer, which only just missed appearing at this year's S.B.A.C. Show, nevertheless deserves mention. Its first flight should now be made in less than two months' time. High-winged, with fixed undercarriage, and powered by two Alvis Leonides engines, the machine weighs 13,500 lb. It is designed

The de Havilland Heron Series 2 for Devlet Hava Yollari (Turkish Airlines). This handsome machine is laid out as a 14-seater.

Napier's Eland-Varsity test-bed, which made good use of the 6,000 h.p. at its command.

to emulate the remarkable small-field abilities of its predecessor the single-engined Pioneer, and has a wide range of flying speed (48-180 m.p.h.). Cruising speed at 5,000ft on 50 per cent take-off power is 139 m.p.h.

Another new civil project, shown in model form on the Scottish Aviation stand, is the Pioneer 4. Only a paper design at present, this 8-seater machine would retain the wings, tail unit and Leonides engine of the earlier Pioneer, but would have a rounder, larger fuselage.

So much for the projects. The real live machines appearing at Farnborough were no less interesting, if more familiar. Of airliners the Comet 3 was undoubtedly the main attraction, both on the ground and in its admirable flying display. The value of time to British airliner manufacturers was emphasized by the restricted appearances of the Viscount and Britannia, while a strikingly effective illustration of the Viscount's popularity with operators was seen on the Vickers stand in the exhibition tent —eighteen models, in the respective colours of those airlines which have ordered the type. A description of each of these machines and an account of their background was given in last week's issue; further photographs appear this week.

RESEARCH

THE direct value of research aircraft as a group was possibly best indicated at Farnborough by the Short S.B.5. Although this machine did not take part in the flying programme, its shape was seen in the static-aircraft park—the shape, as pre-Farnborough photographs showed so well, of the English Electric P.1.

In the S.B.5, the study of basic and of *ad hoc* aerodynamic problems have been combined. The primary purpose was in this case the investigation of the low-speed stability and control problems on swept-wing, high-speed aircraft (it was noted at Farnborough that the aircraft's port wing still carried the wool-tufts customarily used in full-scale airflow investigations). Together with this it was decided to examine the aerodynamic and flying characteristics of a scale model of a particular machine—English Electric's P.1, and this country's first level-supersonic aircraft. Although the initial news of the P.1 omitted any reference to the Short research machine, verification of the obvious came at the Farnborough show. The S.B.5's investigations, the company stated officially, were being carried out in connection with the design team of the English Electric Co., Ltd., working on the P.1. Flight trials in seven different configurations of the variable-sweep machine are said to have been made during the last 18 months.

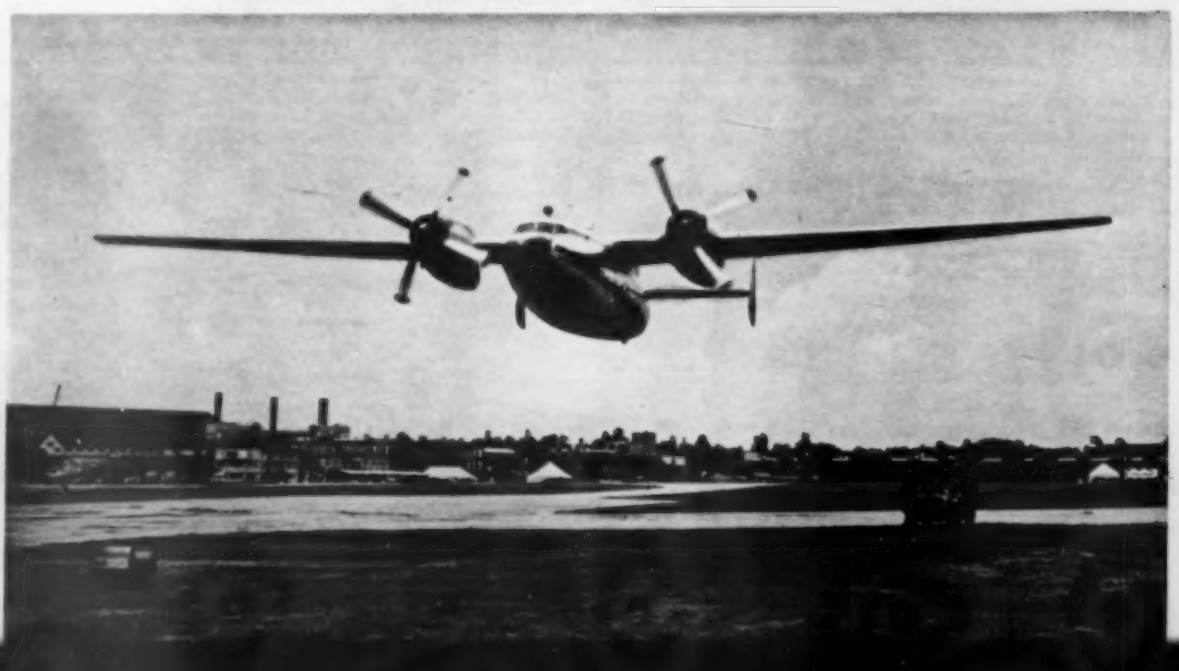
Younger brother of the S.B.5, the little Sherpa is purely experimental, and appeared at Farnborough for the first time this year. In wing planform resembling the Victor and to a lesser extent the Valiant in its progressive reduction of average sweep towards the tip, its main design feature is in fact the use of the aero-isoclinic wing. In employing a flexural axis situated well aft, a torsional stiffness such that a nose-up twist is provided, and wingtip elevons as control surfaces, the worst effects of swept-wing flexure are claimed to be avoided. These effects include tip-stalling at low speeds, torsional instability, and aileron reversal and flutter at high speeds. Somehow bird-like in flight, the Sherpa, which first flew in October last year, continues to provide practical data on this particular approach to swept-wing problems. An automatic observer is carried to record flight-test readings.

Although the Fairey Delta made its first flight as long ago as March 1951, this year was the occasion of its first appearance at the S.B.A.C. Show. Little can be said of its programme of flight-testing except to mention the broad heading of research into the delta-wing configuration. While a high rate of roll is somehow expected of such a machine (having a span less than 20ft) the concrete example given during the Tuesday's flying display proved almost unbelievable—even to those who saw it.

Another delta research machine, the Boulton Paul P.111A, was not present this year at Farnborough, but is continuing its test programme—involving subsonic and supersonic investigations—under Ministry of Supply control. Detachable wingtips enable blunt, as well as pointed, tip characteristics to be observed.

This section, devoted to research and development, would be incomplete without mention of the several experimental flying test-beds which were on show at Farnborough. Representative of many more which are providing the essential kind of engine-running which is obtainable only in the air, they each gave an impressive performance, as we recorded in detail last week. They comprised Armstrong Siddeley's Sapphire-Canberra (Sapphire Sa 7s), Bristol's Olympus-Canberra and Proteus-Ambassador, Napier's Eland-Varsity and Rolls-Royce's Soar-Meteor (two Derwents plus two wingtip-mounted Soars).

A quiet, low passage by Bristol's Proteus-Ambassador, an important accessory to the Britannia programme.



Air Power at Sea

H.M.S. HERMES

The name *Hermes* for a warship goes back to 1796 when a brig-rigged sloop of 14 guns was captured from the Dutch as the Mercurius, and then re-named. The first aircraft carrier to bear the name served the Fleet Air Arm through its formative years and well into the second world war.

The new 20,000 ton Intermediate Fleet Carrier *Hermes* is of the new class equipped with 'angled deck' and steam catapult—these British inventions being the most important modern developments in deck flying. As with her predecessor, Fairey aircraft will be with the Fleet operating from the new *Hermes*.

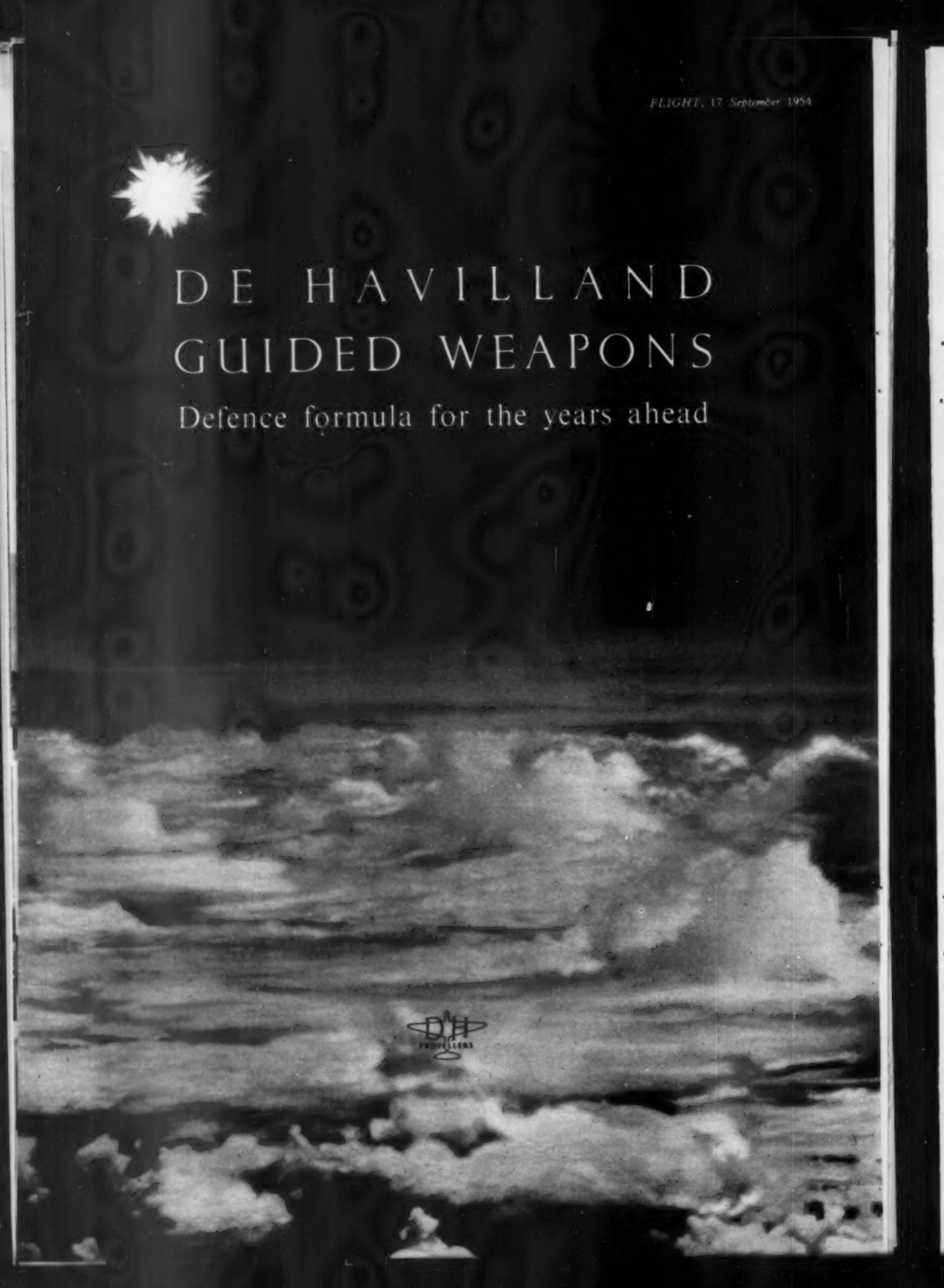
Crown copyright of the badge of H.M.S. Hermes is reserved and reproduction is made by permission of the Admiralty and H.M. Stationery Office.

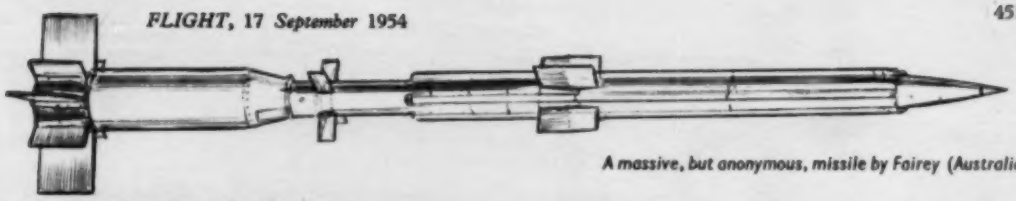
FAIREY

Powered by an Armstrong Siddeley "Double Mamba"

GANNET

THE FAIREY AVIATION COMPANY LIMITED · HAYES · MIDDLESEX


DE HAVILLAND
GUIDED WEAPONS
Defence formula for the years ahead
DH
PROPELLERS



A massive, but anonymous, missile by Fairey (Australia)

FARNBOROUGH REVIEWED . . .

MISSILES

ALTHOUGH the scope of the guided-weapon development programme in the British Commonwealth is, by any standard, enormous, little evidence of the fact was—understandably—to be seen at the show. There were, however, the usual few test vehicles, all of quite early conception and, therefore, now discarded and obsolete. There were also numerous items of accessory or test equipment on view, particularly in the fields of hydraulic, pneumatic and electric power, electronics and guidance systems.

de Havilland. For more than two years, the de Havilland Propeller Company have been principal contractors to the Ministry of Supply in the development of complete guided weapons. Of the great strides which they have made in such work nothing may be said, but a "test vehicle used in the development of de Havilland guided weapons" was displayed on the de Havilland stand. It looked to us much like the R.A.E. combustion test vehicle (LXCTV-2099) which was seen at the S.B.A.C. show in 1952; this was a 1948 design, although presumably the D.H. vehicle was designed after the Propeller Company set up a missile division in 1952. The body of the vehicle alone was shown, and it appeared to be unpowered; no booster unit was displayed. This body was about 70in in length, with a central cylindrical portion about 8in in diameter and a conical nose and tail. Aft of the mid-point were four wings, each about 20in chord and 6½in span, set at 90 deg intervals around the body; at the rear of the cylindrical portion of the vehicle there were four small control vanes, each about 2½in chord by 5½in, likewise disposed around the missile but set 45 degrees away from the wings so that each control surface was mounted behind the gap between a pair of wings. Each of the main wings was apparently milled from thick sheet, with the leading and trailing edges machined off to a knife-edge form; taper was built in from root to tip, and each root was in the form of a massive flange on each side of the wing, through which passed countersunk screws securing the wing to the body. Of particular interest was the fact that the trailing edge of each wing was cut away from the root to within an inch or so of the tip, so reducing the chord by nearly an inch. The portion removed was replaced by a springy wedge of stainless steel secured to the wing at the outer end and passing into the body through a circular bearing set in what looked like silicone rubber. Each strip had a maximum thickness of about one-sixteenth of an inch, and was separated from the wing proper by a spanwise gap. Presumably each strip could be rotated at its root end, but considerable torque would be necessary to produce a torsional deflection of one degree.

English Electric. No guided-weapon exhibit was displayed by the great English Electric group—which includes Marconi and Napier—but their joint stand bore the inscription "Of all the contractors called upon by the Ministry of Supply to do this work [missile development] the English Electric Group by its very nature is alone able to embrace every one of the countless aspects of research, development and large-scale production."

At the same time a photograph of a missile of English Electric design and manufacture has just been released for publication. It is reproduced overleaf, without comment.

Fairey. It is well known that both the parent British company and Fairey (Australia) are right in the thick of guided-weapon development. The principal evidence of this to be seen on the Fairey stands was a massive missile, looking rather like RTV-1, which was displayed on the stand of the Australian company.

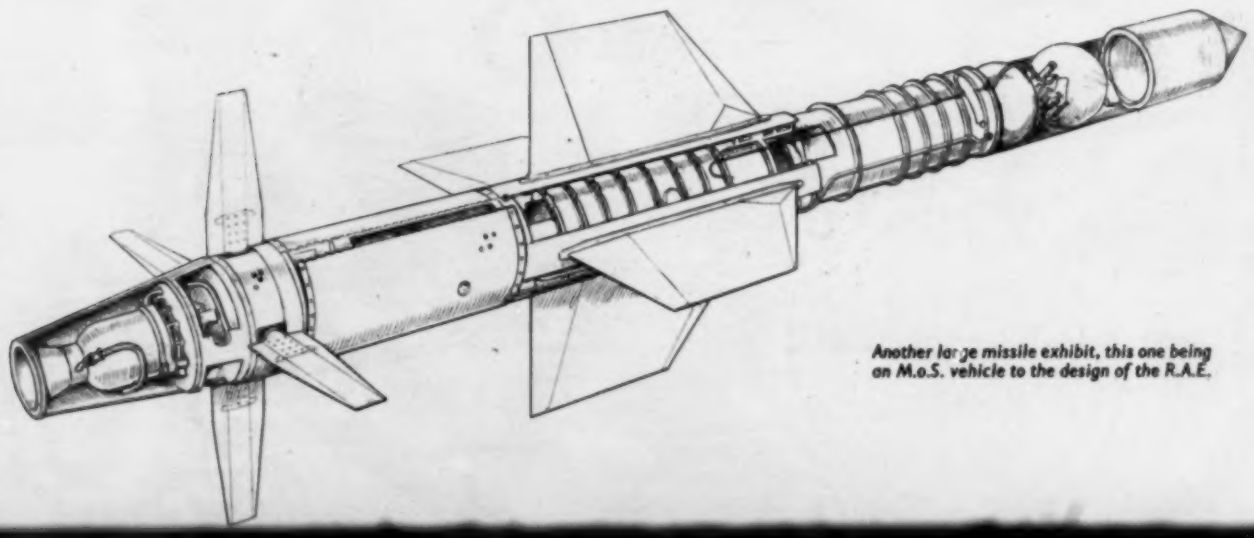
The base was formed by a booster unit about 6ft high and 20in diameter, stabilized by four large and four small fins (see drawing), and housing seven five-inch motors. The main body looked to be about 17ft in length with a constant diameter of 10in. Various forms of construction could be seen, and nearly all the joints were made by countersunk screws. As the drawing shows, unstressed fairings could be seen along each side of the body, almost certainly housing piping, controls and other services requiring attention. The body was fitted with four wings and four small machined control vanes as illustrated. The legend accompanying this lofty vehicle stated that it had been "manufactured by Fairey Australia under contract to the M.o.S. and the Australian Department of Supply."

Fairey Australia also showed a simple, but beautifully made, aerodynamic test vehicle, described as a "three-inch winged round." This was a simple projectile, without guidance, prepared to aid investigations into the properties of various wing/body assemblies at high supersonic speeds. The example shown was about 6ft long, and had a finely finished, white-painted body apparently made of seamless tube. About two-thirds of the way back from the nose was fitted a laminated-wood wing of about two feet span, positioned across a diameter of the body, with a root chord of some 18in and a quarter-chord sweep of about 50 deg.

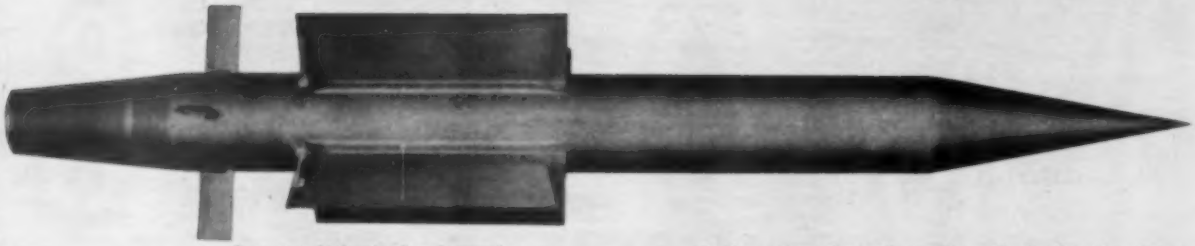
Fairey (England) are also very much in the missile picture, and they are continuing development both in this country and Australia (at Salisbury and at the L.R.W.E. range at Woomera).

Ministry of Supply. Each year, the great parent ministry which guides nearly all the broad aspects of the guided-weapon programme allows itself to draw the veil of security a little farther to one side, and display something tangible—if only something that has been left far behind by rapid development.

This year's M.o.S. missile exhibit was described as a "Guided Missile for the Ministry of Supply to R.A.E. design," and it was shown cut open to a surprising extent. We would date it at around 1949, although it is impossible to arrive at a really accurate estimate of this factor. It was a single vehicle, shown without boosters, and the body was roughly 17ft in length by 15in diameter. The cylindrical/conical nose occupied the first



Another large missile exhibit, this one being an M.o.S. vehicle to the design of the R.A.E.



A test vehicle displayed on the stand of the de Havilland Enterprise. It is referred to in the text.

Another unnamed missile seen immediately after the release of its booster rockets. The photograph was first seen at Farnborough on an English Electric leaflet.

FARNBOROUGH REVIEWED...

3ft 6in and seemed to offer about three cubic feet of stowage space. Next in line came a bottle bay, made as a stressed-skin monocoque aircraft-type structure with riveted L-stringers, something under five feet in length. Within the rear part of this bay could be seen a pair of spherical bottles separated by valve groups, and each bottle appeared to be a seamless unit about 14in diameter with a half-inch wall thickness. The large hinged access panels over this section were removed.

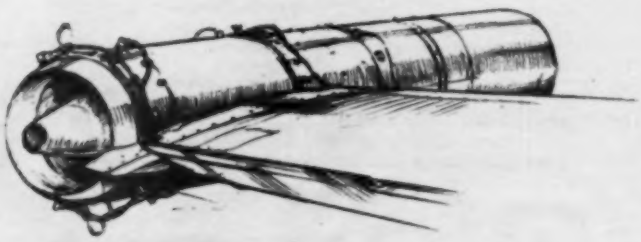
The next nine feet of the body was apparently a centrifugally cast tube, with heavy annular strengthening ribs, the whole being skinned with thin sheet. Within were what looked like a pair of fuel tanks, and the sectioned end of one tank revealed a flexible-diaphragm feed. Around this section were mounted four clipped-delta wings, each of trapezoidal section and about 27in span by four feet root-chord (i.e., each pair of wings had an overall span of about 5ft 9in). The wings were machined from solid, and the heavy flanged roots were secured by through-bolts.

Behind the wings was an equipment bay about 34in long, with an open access door attached by a wire threaded alternately through hinge plates on the door and body (like the leading edge of a Sabre, for those who know that aircraft). Four control vanes were spaced around this section directly behind the main wings, to which they were similar in span. These vanes, which can be seen in the drawing, were apparently of machined light alloy, spliced to a steel fork fitting at the root and attached by 12 screws. The vanes were untapered for the first six inches from the 8in-chord root, and then tapered to a square tip. A single rocket chamber was visible in the extreme tail, and this appeared to have an untapered central portion, and a throat measuring about 4½in across the outer wall. At the throat a yellow pipe led into the chamber, presumably supplying fuel for regenerative cooling.

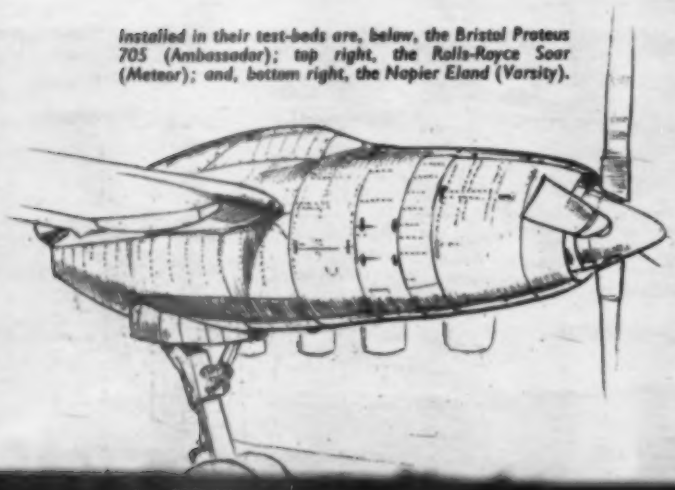
ENGINES

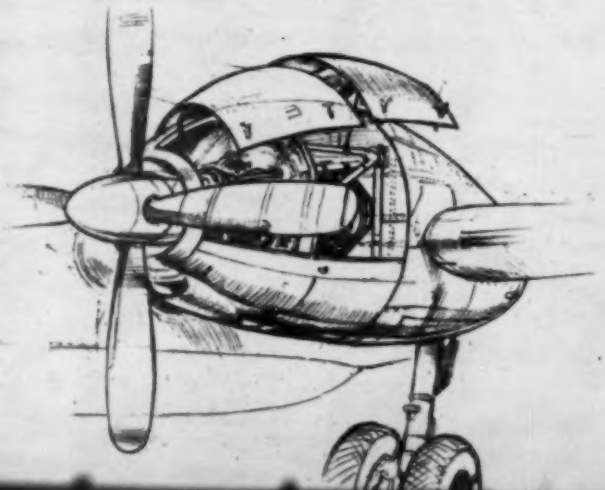
HAD there been no exhibits in the exhibition marquee other than the engines, they alone would have provided the technically minded visitor with many hours of profitable study, and in some cases—for not every unit was obligingly sectioned—conjecture. The notes that follow are concerned mainly with what are commonly known as "high-spots"; amplified details of certain units will appear in future issues.

Alvis. The Alvis company exhibited fixed- and rotary-wing variants of the Leonides and the new 14-cylinder Leonides Major. The helicopter Major had not previously been seen in public, and the display engine itself had, in fact, only recently been completed by the company. It is a vertical-crankshaft engine, although the



Installed in their test-beds are, below, the Bristol Proteus 705 (Ambassador); top right, the Rolls-Royce Soar (Meteor); and, bottom right, the Napier Eland (Varsity).





ALVIS

LEONIDES

The Alvis Leonides Helicopter Engine, a 520 b.h.p. 9-cylinder air-cooled radial engine. Weight complete 645 lb. Power/weight ratio 1·24 lb. (0·562 kg.) per b.h.p. Overall diameter 41·5 in. (105 cm.). In quantity production for the Bristol 171 and 173, also in extensive use by the Royal Navy in the Westland Dragonfly.

ALVIS LIMITED · COVENTRY · ENGLAND

PIONEER DESIGNERS OF THE EJECTION SEAT

LOW EJECTION AT CHALGROVE

To determine a minimum altitude at which a safe ejection is practicable, with their latest Fully Automatic Ejection Seat, the Martin-Baker Aircraft Company conducted air tests at Chalgrove Airfield, Oxfordshire, on August 29th, 1954.

During the tests an ejection was made from a Meteor aircraft flying at 512 m.p.h. at the remarkably low height of fifty feet. The ejection was completely successful, the main parachutes being fully deployed before the dummy alighted without injury.

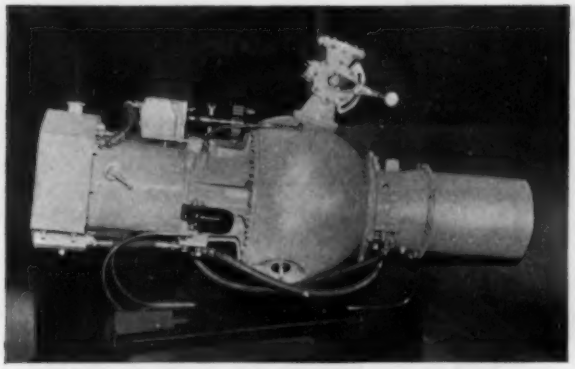
This astonishing feat was made possible by the employment of two stabilising drogues in tandem, designed to reduce, with acceptable deceleration, the speed of the seat after ejection and then to control the main deployment of the parachute, thus eliminating the explosive opening characteristic. This seat was also fitted with the Martin-Baker Patent Aeronautically Controlled Time Release Mechanism and Drogue Gun.

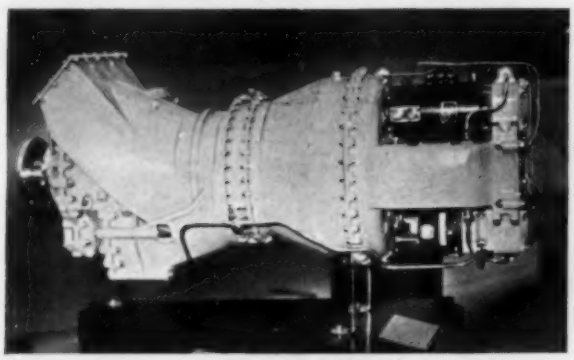
With this arrangement automatic separation from the seat after ejection occurs with insignificant loss of height, and safe escapes near the ground are made practicable. No other ejection seat is capable of this performance.

These design features are patented in the principal countries of the world.

MARTIN-BAKER

AIRCRAFT COMPANY LIMITED HIGHER DENHAM NEAR UXBRIDGE MIDDLESEX





(Top) One of the rationalized Blackburn-Turboméca gas turbines: the Palouste gas producer unit. The lower unit is another Blackburn-Turboméca—the shaft-drive Turmo, in which the exhaust gas is ducted diagonally away after passing through the free turbine.

FARNBOROUGH REVIEWED . . .

helicopter version of the Major can be installed with the crankshaft at any angle.

The placard on the Alvis stand said that the helicopter Leonides Major is "as supplied for the Bristol twin-engined helicopter and ordered for the Royal Navy and the Royal Air Force." The basic fixed-wing engine is, of course, to be the standard power unit of the four-engined Handley Page Herald.

Armstrong Siddeley. The only Sapphire which could be displayed was still the Sa.6, but this year a production engine with the standard 8,000 lb rating was on view. Large numbers of these Sapphires have now been made by the Brockworth factory, and both thrust and specific fuel consumption figures have been met or exceeded by every engine. Many hundreds of pilots have now flown with British Sapphires, and they have praised the handling of the engine at all altitudes, and particularly the fact that it is virtually impossible to stall the engine in flight.

The long-life Viper ASV.5 was another engine that had not been seen before, and the example shown had an inverted-flight oil system, making it suitable for the Jet Provost. The extensive accessory equipment included Lucas fuel pump and air/fuel ratio control, Kelvin and Hughes Mk 8 tachometer generator, ASM/Hobson flow control and Electro Hydraulics solenoid valves. Mention can also be made of the ASV.7R, which is virtually an ASV.5 run at a turbine temperature which would give 1,900 lb thrust were the standard nozzle employed; a larger nozzle is in fact used, of the optimum size for reheat, and with this in operation the thrust is 2,470 lb. It is not intended that a long-life 1,900 lb Viper should be put into production.

This year's Double Mamba exhibit was a production ASMD.1 with the six combustion chambers of each power section fully enclosed beneath heat shields to which two trunks admit cooling air. The engine has a three-point mounting on the main gearbox and two rollers at the sides. On the front are a prominent pair of Rotax twin-breech cartridge starters (type CT-0202). Another feature not seen before was the pair of airscrew-brake actuators mounted on top of the reduction gear, controlling the pair of Lockheed brakes inside—one to each engine/airscrew unit.

Although the Mamba ASM.5 does not really exist except as a power section of the Double Mamba 3, Armstrong Siddeley had made an ASM.5 up into a display exhibit to show the new annular chamber which is becoming standard on later Mambas and Double Mambas. This chamber has 24 burners ignited by a Rotax high-energy box and Kigass spray jets made to ASM requirements. The large oil tank is another feature, as are such accessories as a constant-speed unit, p.c.u. and anticipator.

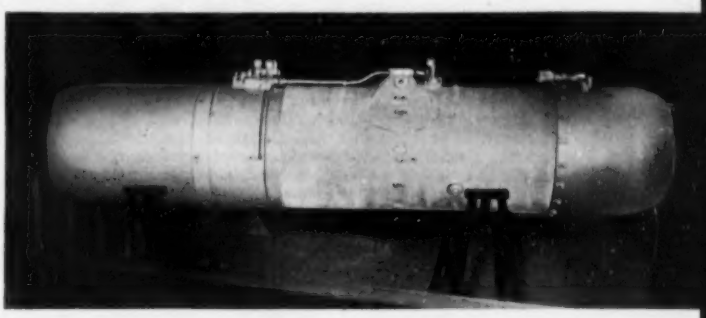
This engine, which was illustrated on p. 407 last week, is rated at 1,590 e.h.p. Most of the accessories are fitted around the front of the engine on "banana-plates", although in the only production application of the single Mamba (the Seamew) frontal area is no problem at all. A remote Rotol gearbox is fitted in this aircraft (it could be seen on Rotol's stand) driven by a shaft running from the rear of the reduction gearbox on the top centre-line.

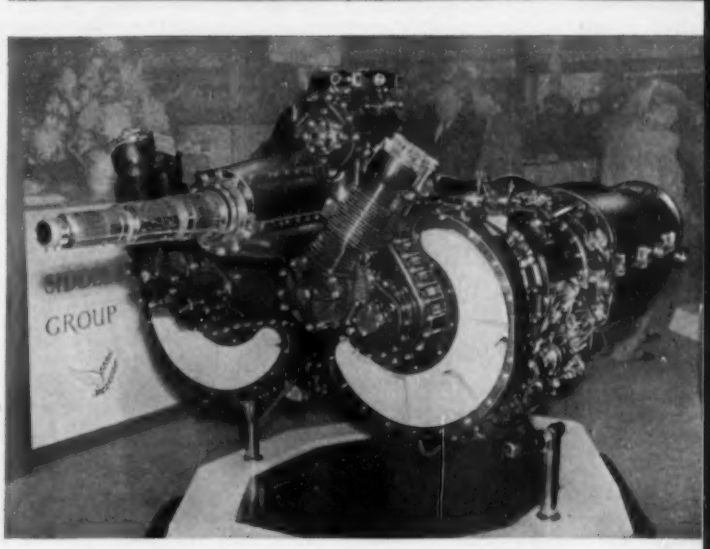
Armstrong Siddeley also showed a beautifully sectioned Snarler for the first time, although the display rocket was not up to the standard reached by the Snarler when development ceased. Of the company's later rocket developments no hint could be given.

Blackburn Cirrus. The Cirrus engine division have completed their extensive rationalization of the original range of French Turboméca engines and two standard series of Blackburn gas turbines can now be offered with all the major components interchangeable between all engines of the same series. One of the most important units is the shaft-drive Turmo, and a development contract exists for a number of coupled Turmo 600s for a British helicopter. Two other Blackburn engines with aircraft applications are the Palas turbojet and the Palouste gas producer for helicopters. As the photograph of the Turmo shows, the standard front end has been redesigned with the accessories mounted above and beneath the pair of rectangular air ducts.

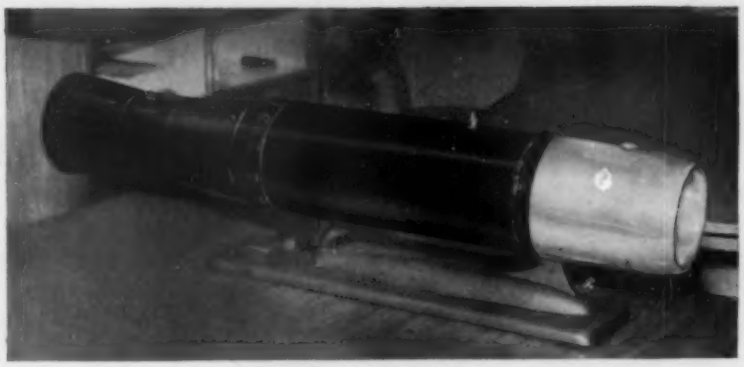
Bristol. The engine division of the Bristol Aeroplane Company were unfortunately not permitted to show a more recent Olympus than the BO1.1, and this impressive exhibit remained largely as before, although there were detail modifications visible. The superb fully sectioned Proteus 705 was once more shown as a mechanized and internally illuminated centre of attraction, as also was the Centaurus power unit. Until this year the Centaurus has

Below are the tiny Rolls-Royce Soar RSr.2 axial turbojet, with blanking caps at either end, and the Armstrong Siddeley Double Mamba, shown this year in full production form.

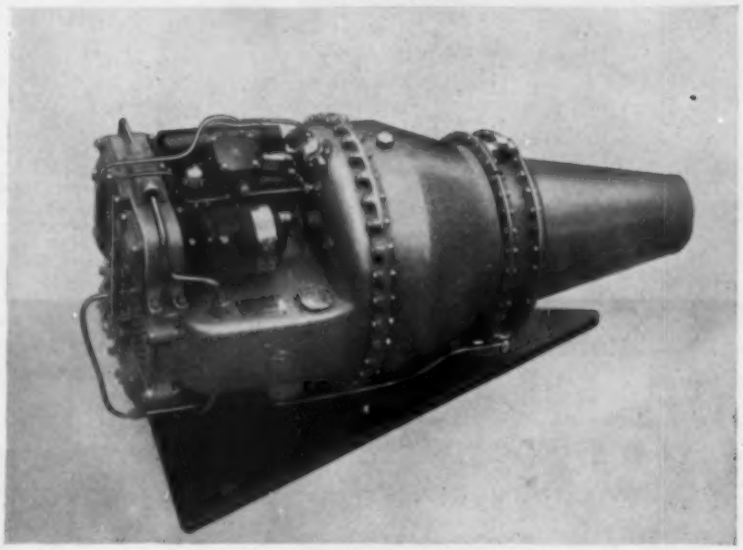




Right, a 120-lb thrust pulsejet by Saunders-Roe.



The Turboméca Palas below is a compact and attractive little unit in its Blackburn form. The florin just visible on the baseboard gives scale.



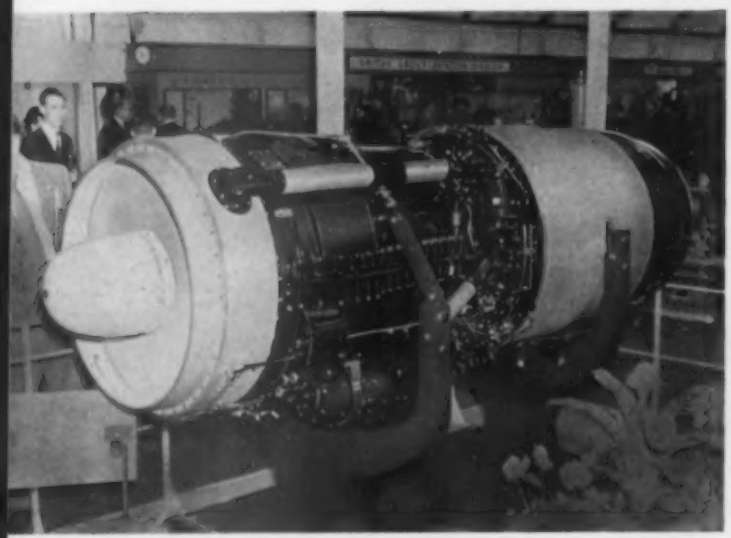
FARNBOROUGH REVIEWED . . .

been of the Series 661 type, but the new Centaurus display engine was a Series 173 for military transports, and a placard announced its power as no less than 2,935 b.h.p.; this is, in fact, the standard take-off power with water/methanol. The Centaurus has controllers on the reduction gear for the de Havilland hollow-steel-blade airscrew, and large exhaust collector ducts are fitted to port and starboard, discharging over the top of the nacelle.

de Havilland. The principal new exhibit by the D.H. Engine Company was the complete Super Sprite a.t.o. rocket pack, as now in production for super-priority aircraft. The Super Sprite itself is comparatively well known, and is a peroxide-and-hydro-carbon motor giving some 4,000 lb thrust for as long as 30 sec. It is installed in a light-alloy, stressed-skin pack, which is supported by folding lateral vee-struts and a long nose probe, the latter terminating in a steel thrust-button which bears against a cup on the side of the aircraft rear fuselage. Owing to the configuration of the mounting, each pack (two per aircraft) is toed outwards from the centre line. The complete unit can be fuelled when in the installed position.

After firing during the take-off run, the complete pack can be jettisoned. An explosive bolt blows away one end of the vee-struts, so permitting the struts to collapse sideways; at the same time a small drogue is streamed to stabilize the pack and, owing to the 2,500 lb decelerating load, to pull it well away from the aircraft. There is also a steel restrainer-tape attached to the nose probe, offering a continuous load of from 200 to 800 lb over a distance of 30 to 40ft. A lanyard joins the drogue to the main parachute, which has a three-point attachment and permits the unit to fall in the horizontal position. When the main canopy begins to take the pull, a catch is tripped which—after a six-second delay—allows the bottom doors to spring open under bungee-power; ram air (the descent rate is 25 ft/sec) then fills three large inflatable bags which cushion the landing shock.

Napier. Sandwiched between the efficient Nomad and Eland was one of the two completely new engines this year—the Napier Oryx. This small turbo gas-generator was first described and illustrated a fortnight ago, but owing to the fact that the Oryx has M.o.S. backing, no very detailed description is yet permissible.



The engine shown was the first prototype, taken from the test bed and painted and polished to display standard. Behind the five combustion chambers and turbine is mounted an annular gas volute, from which the non-throttling delivery valve box leads the gas supply to a remote turbine or to a helicopter rotor. The box itself is of spot-welded steel sheet, and the delivery ducting has a diameter of some 10 inches. The valve box can be mounted in any position; in our previous issue the engine was shown with this component mounted high on the port side, while the display engine has it vertical. Other features noticed on the exhibition Oryx were three vernier traverse pitots mounted in the turbine section; the aluminized combustion chamber casings; and the external pipes for turbine cooling air.

Rolls-Royce. The Avon on display was of the RA.26 type which is virtually identical with the civil engines of the 521 family as used in the Comet 3. These engines have a type-tested thrust of 10,000 lb and are superb pieces of engineering from every point of view. The accessories are mounted along the corners as before in order to fit them for wing burial, and this year's engine showed fewer bleed valves than previously, although a large plate, apparently with a powered gate valve, could be seen above the right-hand side of the compressor. Avon engines now have considerably more than 124,000 hours flying time.

Looking incredibly small in comparison with any other engine on show was the Soar turbojet, first mentioned three weeks ago, and discussed in some detail last week in the paragraph dealing with the Meteor test-bed, in which two were flying at the Display. Rolls-Royce's other exhibit was a standard Dart 506 turboprop of the type now going into world-wide service with the Viscount.

This year's Rolls-Royce Avon was a 10,000 lb-thrust Avon RA.26, one of the first engines in the world to achieve a five-figure type-tested rating.

THE SHOW DINNER

A Further Note on the Speeches : Mr. Sandys on Speeding-up Deliveries

LAST week we reported the announcement, made by Mr. Duncan Sandys, concerning the vertical-take-off machine developed and flown by Rolls-Royce, Ltd. The Minister gave the news in the course of his address at the Show-eve dinner held by the S.B.A.C. and attended by nearly 1,000 guests of scores of different nationalities. It is now possible to devote space to reporting the speeches rather more fully.

The guests were welcomed by Mr. J. J. Parkes, president of the S.B.A.C. and chairman of Alvis, Ltd., who began by appealing for a greater spirit of aeronautical give-and-take. "We all want prosperity for our own businesses and our own home lands," he said, "We wave our own flags, and that is right and proper. But how often do we succeed in co-operating for wider and finally mutual benefits?"

Going on to develop his theme by quoting examples, Mr. Parkes referred to guided-missile development. "We depend on close collaboration with Australia and her rocket range at Woomera," he said, "and you all know of the agreement with America for the exchange of technical knowledge with a co-operative programme which was recently concluded by Mr. Duncan Sandys. It is a remarkable and significant thing that in this new and vital field our common cause is served by a pooling of effort and knowledge between the old world, the new world and the Antipodes."

In paying tribute to those who had helped to make the Show possible, Mr. Parkes mentioned that, while Mr. Sandys, as the responsible Minister, was the man to whom the S.B.A.C. was indebted for permission to use Farnborough, there were others in his Department even more directly concerned, namely, Air Chief Marshal Sir John Baker, the Controller of Aircraft, and Sir Arnold Hall, Director of the Royal Aircraft Establishment. The Society was greatly helped in its responsibility for the stage-management of the Display by the staff of the Establishment.

The Minister began his speech by reviewing achievement in various branches of the industry. He pointed out that expansion in the last few years has been remarkable. Its output was today 2½ times greater than in 1948. During the same period the labour force had risen from 145,000 to 230,000, an increase of about 60 per cent. This implied that on the average each man was producing half as much again as he was in 1948.

Exports of aircraft and engines were earning over £60 million a year. New orders were coming in from all over the world at an increasing rate; and the volume of orders on hand was greater than at any time since the war. This satisfactory state of affairs was in large measure due to the pre-eminent position of British engines.

Gas-turbine Progress

It would be generally recognized that British industry deserved the lion's share of the credit for the extraordinary progress of the gas turbine. Over the last ten years its weight per pound of thrust has been halved and its specific fuel consumption has been reduced by at least 25 per cent. The latest types produced about six times as much thrust as engines of similar diameter ten years ago.

As we moved into supersonic speed ranges, it would become ever more important to increase thrust. This could be obtained either by increasing the power and size of engines or by using a larger number of smaller and less powerful units. It was believed that one of these approaches would be found to have marked advantages over the other. But it was still too soon to arrive at a final conclusion. For the present, therefore, they were going ahead on both lines.

The free-turbine type of engine, with its great flexibility, would seem to be the ideal power unit for the helicopter; but there were also other less orthodox methods of applying jet power to helicopters, and some of these looked most promising.

"We readily recognize that our American friends are at present ahead of the rest of the world in piston-engined helicopters," said Mr. Sandys. "However, if all goes well, there is in my opinion a good chance that the more advanced types which we are now developing will enable the British aircraft industry in due course to come up into the lead in jet-driven helicopters, as it has so successfully done in jet airliners."

The Minister said that whilst on the subject of helicopters he would like to urge most strongly on designers the need to pay very keen attention to the problem of suppressing noise. Helicopter services of the future would no doubt wish to operate from the centres of great cities, but, he said, "In my opinion, unless they can keep their noise within reasonable limits they will not be tolerated. The public will revolt against a service which caters for the convenience of a few at the expense and the annoyance of many. For the sake of national defence people are prepared to put up with a great deal of disturbance from military aircraft, but civil planes are expected to behave in a civil fashion."

Of the tragic accidents to the Comet Mr. Duncan Sandys said: "Unhappily this is the price which the pioneers in every sphere may at times have to pay. . . . The lessons which are being learned from this mournful experience will provide aircraft designers in all countries with technical knowledge of great importance which may well save others from similar misfortunes."

Mr. Sandys next outlined the stages through which a project passes before it becomes an aircraft in service. He went on to say that all these various stages were essential and that none could be skipped. The question was whether they could get through them more quickly. He had studied this matter in great detail with his technical experts and with leading manufacturers, and as a result he was convinced that the whole process not only can but must be speeded up. "Some time ago," continued Mr. Sandys, "I set myself the target to reduce by 18 months the time needed to develop a new aircraft, and with your help I am sure this can be done."

There was no simple or single solution, he continued. The problem had to be tackled from a number of different angles. He could mention only a few examples. One of them was to telescope the development and production stages to a greater extent than hitherto. For instance, the risk had been taken of ordering quantity production of the big V-bombers before the first prototypes had flown. One could, of course, overdo this. If one went into production too soon, subsequent modifications might involve costly re-tooling and serious disorganization.

There were also other ways of shortening the development period. One which stuck out for a mile was to order more prototype or pre-production aircraft for development trials. It sometimes happened that the only prototype in existence was destroyed in a crash or was grounded for extensive modifications. As a result, development might be held up for months on end.

"If we had had sufficient prototypes and pre-production aircraft," said Mr. Sandys, "we might in all probability have got the Swift and the Hunter into service a year earlier."

This lesson had been taken well to heart, and it was now the established policy of the government to order a substantial batch of aircraft for test flying. In the case of the new P.1 fighter, the Ministry had ordered no fewer than five hand-made prototypes and a batch of 20 pre-production aircraft for development trials.

In this connection the Minister paid a tribute to the advice of Mr. Toby Low, former Parliamentary Secretary to the M.o.S.

Problems of Research

Of research, the Minister said: "Our knowledge of aerodynamics in the higher supersonic speed ranges is still very incomplete, and we have to rely to a considerable extent upon experience gained by trial and error. However, a great deal of this can be obtained by trials with small models in wind-tunnels . . . wind-tunnels are very expensive things and the power needed to operate them is enormous. To blow air at a moderate supersonic speed through a pipe a few feet wide may very likely require an engine of somewhere between 50 and 100,000 h.p. A single wind-tunnel can quite easily cost as much as £10 million.

"Nevertheless, I can assure you that the heavy expenditure involved will not deter us from going ahead with the provision of these and other research facilities which are necessary."

The aerodynamic problems of the sound barrier, which a few years ago appeared so formidable, had now been largely solved. In fact, the new P.1 fighter the other day slipped through the sound barrier "by mistake." There was such complete absence of buffeting that the pilot, who had not intended to fly supersonic, found that he had got up to well beyond Mach 1 without noticing it.

The next major technical problem was that of heat. This had been wrongly called "the heat barrier." There was, of course, no such thing. It was the problem of heat caused by surface friction between the aircraft and the air. At an altitude of 40,000ft, heat began to present an acute problem at about 1,700 miles an hour. At that speed the temperature of the aircraft skin would be about 180 deg C. These, said Mr. Sandys, were Sir Arnold Hall's figures.

If, therefore, we wished to fly at appreciably higher speeds we should have to apply all our ingenuity to design airframes which minimized air resistance, devise suitable methods of insulation, and develop structural materials capable of withstanding much higher temperatures.

The Minister concluded by making the announcement of the Rolls-Royce vertical-take-off experiments. For the benefit of any readers who may not have seen last week's news, we repeat the principal points here. After referring to current vertical take-off experiments in America—where, as he said, aircraft were being cocked up on their tails and flown into the air like rockets—he revealed that we in Britain "are concentrating rather upon techniques designed to enable aircraft to take off vertically from a normal horizontal position.

"The necessary upward lift is provided by downward-facing jet streams whose direction can be varied to control the angle of climb. These could be provided either by small subsidiary engines, or, alternatively, by the deflection of the jet stream of the aircraft's main power units. These are, of course, no more than research projects. But good progress is being made.

"In conjunction with the Ministry of Supply, Rolls-Royce have constructed a test vehicle embodying this principle. I can hardly call it an aircraft, for it is really no more than an aero-engine with a pilot mounted on top. A few weeks ago this strange contraption, which weighs 3½ tons, successfully lifted itself into the air without the aid of wings or rotors of any kind. It then proceeded to circle around under complete control for about ten minutes and landed again without trouble—a very remarkable performance.

"It may well be," continued Mr. Sandys, "that these new and exciting experiments will in due course lead to a revolution in aeronautical development every bit as important as that which has resulted from the introduction of the jet engine."

AIRCRAFT INTELLIGENCE

PEALING: From top to bottom are a standard Bell Model 47G demonstration helicopter (Franklin engine); an Army H-13 with the more powerful Lycoming; and the experimental Model 47G-1, a four-seater for a variety of cabin arrangements. A note appears on this page.

Great Britain

Saunders-Roe Skeeter Mk 6. This latest version of the Skeeter has a D.H. Gipsy Major 30 engine delivering about 200 h.p. at the 1hr rating, and flies at a gross weight of 2,200 lb. Disposable load is increased by 80 lb. Manufacturers' figures are: main rotor diameter, 32ft; length, 31ft 1½in; width, 28ft; height, 9ft 11½in; max. cruising speed, 101 m.p.h.; hover ceiling in ground cushion, 4,200ft; max. rate of climb, 940ft/min; service ceiling, 10,040ft; max. range, 259 miles.

U.S.A.

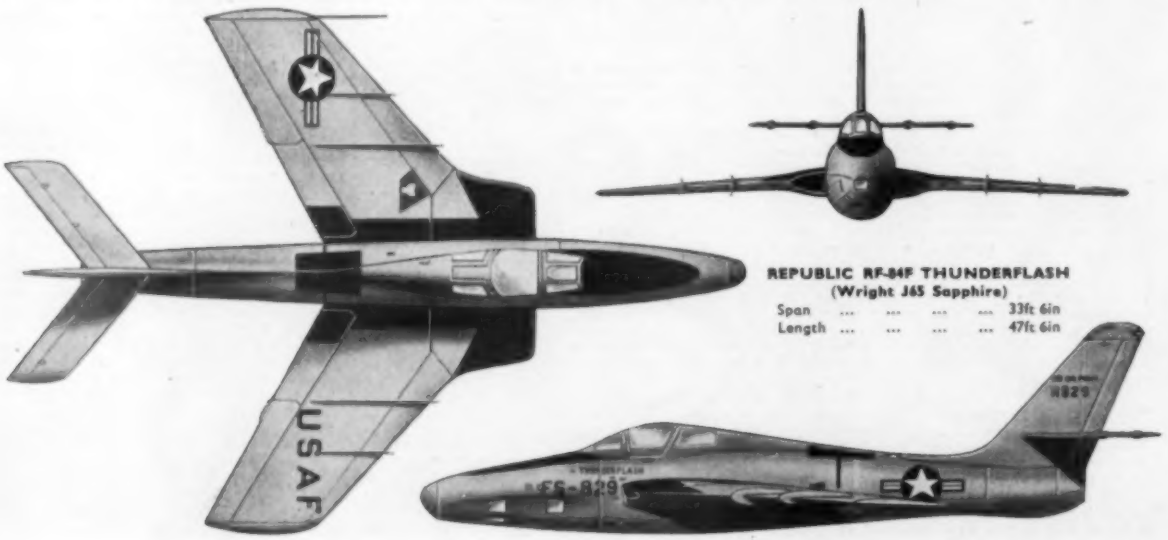
Lockheed R7V-2. Our previous issue carried a photograph of this U.S. Navy transport, the world's fastest and most powerful airscrew-driven transport. The maximum cruising speed is claimed by the makers as 440 m.p.h., which can be believed in view of the great power delivered by the four Pratt and Whitney T34 turboprops (5,500 e.s.h.p. each). It is further claimed that the machine can fly 16-ton loads across the North American continent in less than 6 hr, or fly the Atlantic with one stop in 8¾ hr (New York-Gander-London). Lockheeds have a contract for two R7V-2 prototypes, and two similar machines, designated YC-121F, will go to the U.S.A.F. A payload of 10 tons can be carried for 3,000 miles with full fuel reserves. Fuel capacity, including two 600-U.S. gal wing-tip tanks, is 8,750 U.S. gal. Gross weight is 150,000 lb and service ceiling 35,800ft. As an ambulance the R7V-2 will carry as many as 73 patients in litters, with ample gangways for four attendants to minister to them.

Bell Model 47 Variants. Two new versions of the versatile Bell Model 47 helicopter were displayed at the National Aircraft Show, which opened at Dayton, Ohio, on September 4th. One is a four-seat utility machine designated 47G-1, and the other a Lycoming-powered Model 47G (H-13G). Powered by a Lycoming O-435 which, with a take-off rating of 260 h.p., provides speed and range performance considerably greater than for existing models, the 47G-1 has provision for passenger-cargo, full cargo, litter and hoist accommodation. Conversion to any of the cabin configurations can be made in the field without the use of tools "in a matter of minutes." By de-rating the Lycoming power plant for the Model 47G decreased maintenance is achieved while an increase in available power over the present engine results in greatly improved hot-weather and high-altitude performance. The Bell Aircraft Corporation will send the new models on tour to determine customer reaction before going into production.

McDonnell F-101 Voodoo. Developed from the earlier Voodoo XF-88 of 1949, the F-101 is the heaviest fighter ever built. Powered by two 14,500 lb-thrust Pratt and Whitney J57-P-9 turbojets, it has a fuselage some 80ft in length, and the total internal tankage exceeds 2,500 U.S. gallons. Wing loading must be very high, for the span is very much less than 60ft. The aircraft is designed for an operating maximum speed higher than that laid down for any other U.S.A.F. aircraft at present—some 900 knots. The Voodoo is to be built in various fighter, escort and photo-reconnaissance forms, and the prototype XF-101 is virtually complete, and is soon to start a 12-month flight test programme at Edwards A.F.B., California.

France

Notes from Nord. Production of the Nord 2501 Noratlas twin-Hercules transport for the French Government is going ahead well, and the 34th machine is known to have been delivered as long ago as June 25th. Nord are also in production in their factory at Meaulte with the N.C.856 A.O.P. machine. A total of 110 aircraft of this series will be built and the first examples were coming through at the beginning of this year. A two-seat civil trainer—the Nord 3201—made its first flight at Bourges on June 22nd, and the Nord 1750 helicopter, with a Turboméca Artouste, began its test programme at the beginning of July.



REPUBLIC RF-84F THUNDERFLASH
(Wright J65 Sapphire)

Span	...	...	...	...	33ft 6in
Length	...	...	...	...	47ft 6in

THE ANSWER TO EUROPE'S AIR DEFENCE PROBLEM

Trends that were unchecked for forty years so increased the size, weight and cost of the standard fighter and the difficulties of its design, production and operation, that few countries have the resources to build or buy the fighters they need for their defence. A halt has now been called, and a new trend started by the Folland Gnat, a light jet fighter with a flying and fighting performance that meets the sternest demands of modern war and provides the answer to Europe's air defence problem.

The following comparisons with the standard fighter illustrate some of the more significant merits of this new type of aircraft.

● MAN-HOURS
Tooling time for production is halved, and twenty-five light fighters instead of five standard fighters can be built in the same number of airframe man-hours.

● COST
Twenty light fighters, fitted with all essential flying, navigational and armament equipment, can be built for the price of six standard fighters.

● FIRE-POWER
The five light fighters produced in the time needed for one standard fighter can bring to bear 10 × 30-mm. cannon instead of the 4 × 30-mm. cannon, or 6 × 0·5-in. machine-guns of the standard fighter.

● HANDLING
With its high thrust-weight ratio, powered controls, and low lateral inertia, the light fighter will have outstanding manœuvrability. Pilots can learn to fly it in less time because of its simplicity and handiness.

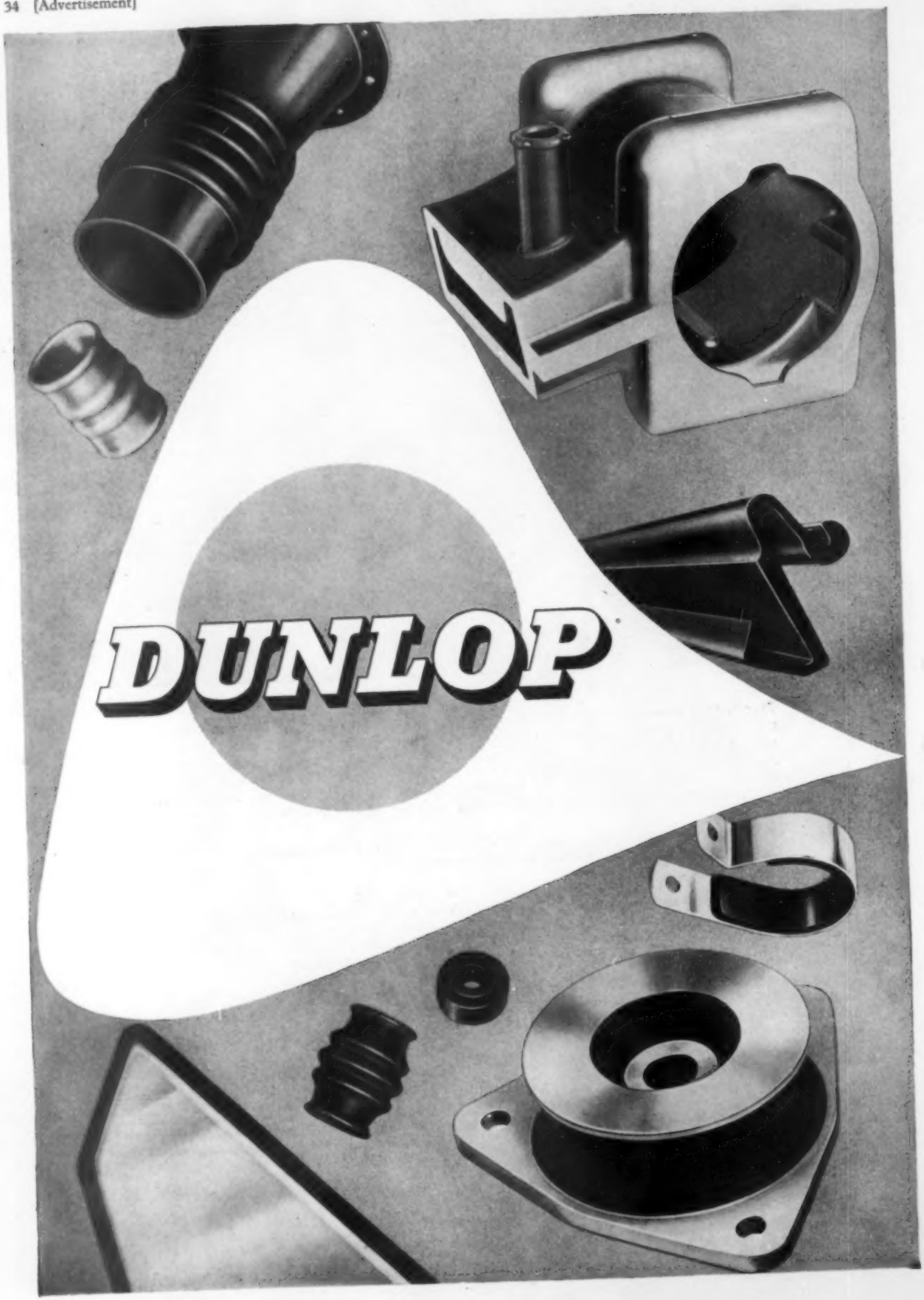
● SERVICING
The simplicity of aircraft services and the smaller amount of equipment installed cut servicing time and increase operational strength. All items needing routine attention are sited where they can be reached without trestles or staging.

● MOBILITY
Light fighters can be carried by air freighter, ship or lorry with little or no dismantling, and can be given ample flight duration for ferrying by the use of long-range tanks.

The Gnat and its first prototype, the Midge (pictured above), are private ventures by

FOLLAND AIRCRAFT LIMITED

HAMBLE • SOUTHAMPTON • HAMPSHIRE


DUNLOP

RUBBER GETS AIRBORNE

Designers depend on it for vital components

The term 'rubber' no longer refers only to the milky juice or latex collected from trees and plants. It has been extended to cover many synthetic materials possessing similar properties of flexibility, compressibility and elasticity. Years of research have enabled Dunlop scientists accurately to select these materials and to design components capable of operating with maximum efficiency under very diverse conditions.

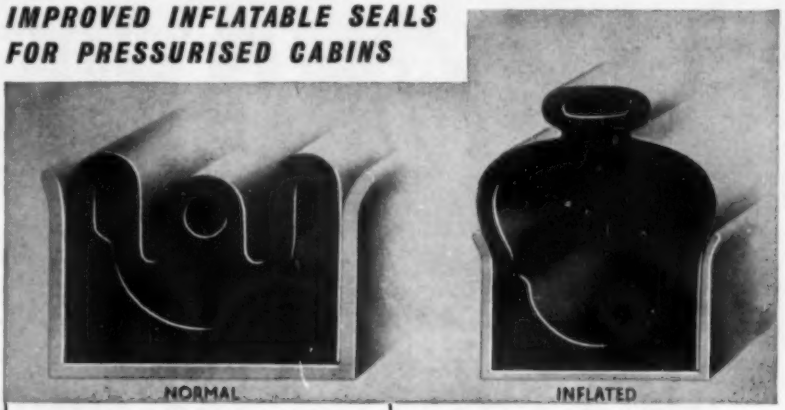
This essential versatility has resulted in the choice of rubber for three or four hundred separate components in the modern aircraft. Many of these use metal bonding techniques giving a strength in tension and shear of some 1,000 p.s.i. This process has greatly extended the use of rubber for engine and anti-vibration mountings and similar products.

Compounding and curing techniques vary for almost every project and application. The extent of the range of products shows why.

It includes compression rubbers for a variety of applications; bellows to separate or protect moving parts from vapour or liquid or dust; O-rings and oil seals; inflatable seals for doors and windows; diaphragms of plain or fabric-reinforced rubber; and heat-resisting sheet for vacuum blankets and de-icing systems.

These Dunlop products are in use on almost all of Britain's most famous Civil and 'Super-priority' Service types of aircraft.

IMPROVED INFLATABLE SEALS FOR PRESSURISED CABINS



The illustration shows a typical inflatable seal from a new Dunlop range. These seals can be operated at higher inflation pressures, make a more effective seal between irregular surfaces, and when deflated allow greater clearance between the two faces without interference or scuffing. The new seals are fabric reinforced and tailored to suit the requirements of individual designs.

3,000 VIBRATIONS PER MINUTE

'Shake' test for Flexible Pipes

When components are as important to aircraft safety and performance as Dunlop Flexible Pipes, no test for quality is too stringent. Every new type of hose and coupling is thoroughly tested before release. With one test the pipe is charged with its operating fluid and subjected to 3,000 vibrations per minute. In addition, pressure impulses of up to 5,000 p.s.i. jolt the pipe 12 times per minute throughout several hours of testing.

In the Dunlop Test-house there are facilities for proving—in addition to endurance—flexibility, resistance to inward leakage and collapse, tensile strength, length change, volume increase, flame resistance and ultimate pressure. Like all Dunlop aviation equipment, flexible pipes leave the factory ready to meet and master all the exacting demands placed upon them.

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Twentieth Anniversary of Development by Dunlop

Twenty years ago this year marked the beginning of the end for the aeroplane's trailing earth chain. For 1934 saw the development by Dunlop of conducting rubber and the 'Ecta' Aero Tyre. Today this type of tyre is universal and the static electricity picked up during flight, often many thousands of volts, is earthed the second the aircraft touches down. There can be no question but that the 'Ecta' ranks as a major contribution to the reduction of fire risks and the increased safety of flying.

Dunlop makes things better for everyone

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As the ceiling of modern aircraft becomes increasingly higher, instruments must keep pace with requirements. This newly developed Smiths Altimeter registers up to 60,000 ft. with the same precision as lower range instruments. The range has been extended by refinements in the linkages, the extensive use of jewels, and the incorporation of a special low hysteresis capsule. Size and weight are the same as standard Altimeters.

A short while ago he was testing a supersonic aircraft — doubtless using Smiths instruments designed for high speed flight. Special instruments for development work have always been a major consideration of Smiths, though the organisation is no less concerned with making sound, reliable equipment for everyday flying.

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SM 11

THE PROBLEM OF NOISE

—*from Aircraft on the Ground and in the Air: Some Attempted Solutions*

THE testing and operation of military jet aircraft, the impending use of airports by turbojet airliners, and the use of London's South Bank site by helicopters: all these have recently focused attention on the subject of aircraft noise. It is extremely difficult to decide how much noise should be tolerated in the interests of progress. Rail and road transport make plenty of noise of a kind to which we have long since become accustomed; but jet aircraft and helicopters are relative newcomers and are putting noise where none existed before. They are therefore apt to be resented.

Whatever one's views on this controversial question, it is clearly desirable that noise made by aircraft, whether in flight or on the ground, should be reduced to the lowest level consistent with safety, efficiency, and economic limitations. This is clearly the policy adopted by the Ministry of Supply, on whose behalf much research on noise suppression is being undertaken at universities and colleges, in factories, and also at the National Physical Laboratory.

The noise made by jet aircraft is due simply to the fact that the engine discharges behind it a stream of hot air, which mingles with the cool air and produces turbulence. It is this turbulence which is the source of noise. A turbojet may discharge gas at a rate of kinetic energy equivalent to nearly 10,000 kW and the noise produced may be of the order of perhaps 20 kW of sound. It is thus a relatively inefficient noise-producer as such; but the extent of the problem becomes apparent when it is considered that the power of the human voice is normally less than a milliwatt.

Some significant figures were recently given by E. J. Richards, Professor of Aeronautical Engineering at the University of Southampton. A noise-level of 80 phons is approximately that of a very busy street and would definitely interfere with speech if it were not for dissipation of the sound in its propagation through the air. Such a noise might occur for 12 miles along the path of a six-engine jet airliner with reheat and 16 miles for one with supersonic airscrews. That is to say, it would be necessary to stop talking at Westminster each time a jet airliner of this type flew eastwards from London Airport.

The degree of turbulence produced, and hence the noise, increases very rapidly with the velocity of the jet and also depends on the velocity gradient at the edge of the jet. One approach to the problem of noise-reduction is to reduce this velocity gradient; in other words, to make the change of velocity at the boundary of the jet less sudden.

During the past few years research on these lines has been in progress at Southampton and Manchester Universities and also at the College of Aeronautics. Several devices evolved at these centres have been tested on scaled-down jets. The most promising consists of a series of "teeth" attached to the jet nozzle, either parallel to the jet axis or bent inwards. Rolls-Royce have tried out this device on a full-scale engine and found that it would markedly reduce the low-frequency noise from a (subsonic) high-velocity jet, but at the expense of some increase in high-frequency noise.

There is also the possibility of designing an engine to use a lower jet velocity; but the difficulties presented are very great. The principal obstacle is that an engine capable of producing a given thrust at lower temperature and lower jet velocity must inevitably be of larger diameter, with consequent increase in weight and drag. Since the main advantage of a turbojet is its lightness, very powerful arguments would be necessary to support the case for a heavier engine. It is also probable that noise could be reduced by using a number of small engines instead of one large one; but this would also result in increased drag and fuel consumption, would make installation more complex, and in the end might merely alter the *character* of the noise produced. Another possibility which has been suggested is to discharge the gases from a slit running along the entire length of the wing instead of from an outlet of the normal type.

Since high jet-velocity is the principal source of noise, it is unfortunate that the use of reheat, which is one of the most useful methods of getting a large thrust out of a small engine, depends entirely on increasing this velocity. This formidable noise problem requires to be mastered in order that advantage can be taken of the tremendous potentialities of reheat, at any rate for military aircraft.

Another problem associated with jet engines is the intake noise. This takes the form of a high-pitched scream, which is particularly noticeable at low power, e.g., when the aeroplane is taxying or is approaching to land. It differs with the type of engine and has been considerably reduced in some units of modern design.

In engines of the turboprop type the power of the jet is absorbed by the airscrews, with the result that the kinetic energy thrown out is very much less and noise is correspondingly reduced. Airscrew noise is generated by periodic excitations in the airflow, these being due to the displacement of air caused by the moving blades and also to various forces exerted on the air by the blades. As the flying speed of aircraft becomes higher the tendency is to increase the speed of the airscrews and hence the noise. Tip velocity is the most important factor in airscrew noise; when it exceeds the speed of sound—as it might well do in some of the more modern types of turboprop aircraft—the nuisance is considerably increased.

To reduce tip speed without any reduction in thrust, it would be necessary to have blades of smaller diameter and to increase their number or, alternatively, to use blades of larger diameter running at a slower speed. Both these alternatives have disadvantages from the designer's point of view. If more blades are used the weight is increased and it also becomes necessary to provide increased accommodation for the gears for varying the pitch. All this adds to drag. A blade of larger diameter also has the disadvantage of increased weight; in addition, it requires more ground clearance and increased distance of the engines from the fuselage and, in multi-engined aircraft, from each other. Thus the aircraft designer is continually obliged to make some kind of compromise between efficiency and the suppression of noise.

In flight, the velocity of jets relative to the surrounding air is considerably reduced, with beneficial effects on noise, but this improvement affords little relief to people living in the vicinity of aerodromes or maintenance areas. On the other hand, the problems of noise coming from aircraft on the ground, while by no means simple, are rather less difficult than those associated with noise from aircraft in flight. By far the most serious noise nuisance is that presented in maintenance areas as a result of prolonged running, which consists of operation at medium power, with occasional bursts of maximum power. When the engines are run, the noise radiated is dependent on the engine operating conditions. In the case of an aeroplane with gas turbine power, it will come both from the intakes and from the jet nozzles. The jet noise will be predominantly of low frequency, causing the familiar roar, and will increase with increasing engine speed.

There is some prospect of reducing the noise from running-up during maintenance, but it is evident that the cost of sound insulating barriers and silencing devices will be very high. Experiments are starting in Britain on transportable mufflers, consisting of a large pipe, lined with sound-absorbent material, into which the jet is discharged. Only a limited degree of reduction can be expected from a system of this nature unless it can be tailored to fit the particular aircraft. At present the reduction which can be foreseen is not more than about 20 decibels.

To achieve any further improvement would involve a much more elaborate construction, the rear part of the aeroplane being enclosed in a structure comprising virtually a complete engine test-house. One of the major difficulties, apart from cost, would be to provide doors which were sufficiently soundproof and at the same time large enough to admit the aeroplane. It is clearly impossible to surround the aircraft completely, because of the need to disperse the slipstream and jet efflux. Another limitation is imposed by the occasional requirement for having the aeroplane facing into the wind, which renders it desirable that the obstacle should be capable of withstanding the efflux of a jet aircraft.

In the United States, reductions of up to 25 or 30 decibels have been achieved by putting tightly fitting mufflers round the jets and also round the intakes, the total cost being about £25,000 for a twin-engined aircraft. Such installations, however, are very complicated and would scarcely be suitable for everyday use in a busy maintenance area.

It has been shown that reductions up to 25 phons—a valuable gain—can be achieved by the provision of running-up pens, which have the further advantage of being equally effective for all types of aircraft. After a full-scale investigation at London Airport, using an experimental wall of asbestos sheeting fixed to a steel scaffolding, the Ministry of Civil Aviation has built a prototype running-up pen of more permanent construction at this airport.

Apart from their high capital cost, such devices as mufflers or running-up pens are bound to cause some inconvenience during maintenance, and it remains to be seen whether the performance of engines will be influenced by the effect of obstacles on the airflow into the intakes of jet engines. Noise-abatement treatment,

THE PROBLEM OF NOISE . . .

however desirable, must be subject to the limitations imposed by the safe operation of regular and economic airline services. Engine performance must not be so altered that correct functioning cannot be checked, and maintenance requires to be carried out within the scheduled period, in order that the aircraft should be ready at the appointed time to receive passengers or cargo.

The opinion has been expressed that in areas which are not very thickly populated it might be cheaper to pay compensation for noise nuisance than to incur the cost and inconvenience of noise reduction.

The helicopter presents problems of a different type. Measurements made on a single-engined machine by the Acoustics Section of the Physics Division, National Physical Laboratory, showed average sound levels of 98 db at 100ft, 94 db at 200ft, 85 db at 1,000ft, and 75 db at 2,000ft. Yet the ability to operate without restriction is clearly of vital importance, since helicopters must be able to go right into the centres of cities if they are to play a major rôle in air transport.

In the helicopters at present in service the chief culprit is the engine exhaust, which is considerably noisier than the rotor blades. Since the helicopter is a comparatively slow-speed aircraft, there is some prospect of being able to fit silencers large enough to muffle the exhaust, but at the cost of increased weight and consequent reduction in payload. When hot, a silencer has the further disadvantage of adding to the risk of fire.

Further possibilities are presented by altering the location of the exhaust. Normally the exhaust is situated beneath the aircraft and throws the noise downwards to the ground. If it were made to discharge upwards the ground would be shielded to some extent; but in offices on high floors the nuisance would merely be aggravated.

There is no yardstick by which the discomfort of helicopter noise can be assessed. Much depends on what those who hear the aircraft happen to be doing at the time, and still more on the frequency of flights. The noise might be sufficient to interrupt communication in offices with open windows for perhaps 20 or 30 seconds each time the helicopter passed. If this happened only once in a few hours the inconvenience would be negligible, but a ten-minute service might create a serious nuisance.

The single-engined helicopters at present operating between London Airport and South Bank are obliged to follow the river closely in order that a safe alighting place may be available in the event of engine failure. The position may be eased by the advent of helicopters with twin engines, which are capable of operating on a single engine, and can thus vary their course to a very much greater extent.

Some anxiety has been expressed as to the potential nuisance value of the sonic bang. Assuming that the pressures involved are only of the order of 1 lb/sq ft, the bangs are scarcely likely to cause material damage to well-built structures, but their effects on persons who are constantly hearing them could be disturbing. It is also possible that glass could be shattered by bangs from aircraft flying at relatively low altitudes. This problem will be encountered in the immediate future in the vicinity of airfields from which there is test flying at supersonic speeds; but eventually the nuisance will become much more widespread. For example, a supersonic aircraft flying at an altitude of 20,000ft would cause bangs at all points along its path as it passed overhead.

Nothing can be done by designers to reduce the noise due to sonic bangs, for this would involve reducing the strength of the shock waves, and it can safely be assumed that all possibilities in this direction have been examined for the purpose of reducing drag. It would seem, therefore, that this source of noise could be controlled only by orders to pilots.

A. G. T.

REMEMBERING THE BATTLE OF BRITAIN

THIS week is Battle of Britain Week, and tomorrow, Saturday, 58 R.A.F. stations are to be "at home" to the public (a list was given on page 396 of last week's issue). Among the younger generation, in particular, there is, perhaps, a tendency to overlook the real significance of the week; and this underlying theme is well brought out in a special appeal issued by Viscount Knollys, G.C.M.G., M.B.E., D.F.C., chairman of the Council of the Royal Air Force Benevolent Fund. He writes:—

"In these anxious times, when thoughts of atomic warfare are so much in our minds, it is timely to remember the Battle of Britain—which gave us deliverance from perils seeming at that time insuperable. This present year, which has seen the installation of Sir Winston Churchill as Knight of the Garter, brings the 14th anniversary of that proud victory with which he will be for ever identified. Our thoughts turn now to that Battle and to the many subsequent air battles that meant so much in pain and suffering to the families and dependants of those who played their magnificent part in them.

"May I appeal to your readers today to give practical thanks for our victories in 1940 and the years that followed. My plea is not only for the families and dependants of those who fell in that Battle, but also for all who are serving or have served in the R.A.F. or W.R.A.F., their families and dependants.

"The Royal Air Force Benevolent Fund, of which I have the honour to be chairman, exists to help these people in time of distress. Last year alone the Fund aided 22,752 cases at a cost of £588,364. Nearly £5½ million has been spent since VJ Day, the number of awards made during that period being some 248,000. Sad to say, expenditure at this high rate, which is likely to be needed for a great many years to come, can only be continued if further public support is forthcoming—a fact which makes my appeal urgent.

"Sir Winston Churchill has said: 'The Royal Air Force Benevolent Fund is part of the conscience of the British nation. A nation without a conscience is a nation without a soul. A nation without a soul is a nation that cannot live.'

"We shall be most grateful for every donation—all will be acknowledged. Cheques, postal orders or stamps should be sent to me at 67, Portland Place, London, W.1. (Langham 8343.)"

NEW AIRCRAFT PART STANDARDS

RECENT aircraft standards published by the British Standards Institution include the following:—

SP. 107 to 112: Tab Washers for Unified Hexagons for Aircraft. These standards specify materials, dimensions and finish of mild steel and corrosion-resisting-steel tab washers of various patterns suitable for use with aircraft unified hexagons.

SP. 113: Cadmium-plated Close Tolerance Shear Pins for Aircraft. This specifies materials, dimensions, finish and part numbers of shear pins which are cadmium-plated for use in aluminium alloy material.

Copies of SP. 107 to 112, which are contained in one publication, price 2s. 6d., and SP. 113, price 3s., are obtainable from the British Standards Institution Sales Branch at 2 Park Street, London, W.1.

Also published are *A. 109 and A. 110, Shear Bolts and Nuts (Unified Hexagons and UNF Threads) for Aircraft* (price 5s.), and *A. 112, Cadmium-plated Shear Bolts (Unified Hexagons and UNF Threads) for Aircraft* (price 3s.). These standards specify materials, dimensions, finish and testing of shear bolts and nuts, and contain details of the method of identification. A. 112 provides a range of steel bolts cadmium-plated for use in aluminium alloy.

McKEE TROPHY WINNER

THE McKee Trans-Canada Trophy for 1953 has been awarded to Mr. Franklyn I. Young, who is operations manager for T.C.A.'s central region at Toronto. The award is in recognition of his "great drive and leadership" as chairman of the National Air Show Committee in 1953 and to his successful efforts to have the Show and the International Trade Fair staged together. The trophy was established by the late Dalzell McKee of Pittsburgh, a wealthy aviation enthusiast who made the first trans-Canada flight by seaplane in 1926; he gave the trophy in recognition of the assistance afforded him by the R.C.A.F.

DISCUSSIONS ON TITANIUM

FOR the benefit of members unable to attend the 1954 autumn meeting of the Institute of Metals, held in Switzerland, a two-day meeting is to take place in November at the Institute's London H.Q., 4 Grosvenor Gardens, London, S.W.1. On Thursday, November 25th, at 2.30 p.m., there will be discussions on eight papers, all concerned with titanium alloys, published in the Institute's journal. On the Friday, beginning at 10 a.m., five other papers will be discussed. Non-members will be welcome.

INTERNATIONAL INFORMALITY

TYPICAL of many informal parties held during Show week, though unique in its way, the annual gathering of overseas agents of Bryans Aeroquipment, Ltd., took place on Wednesday of last week. This year no fewer than 23 different countries were represented, the guests numbering about fifty all told. Newcomers this year were from Germany, Turkey and Chile.

Mr. J. R. Bryans (managing director) welcomed the guests, and briefly reviewed, for their edification, the company's various new lines of equipment. These include the D.P. (differential pressure) or Machmeter tester, shortly going into quantity production; a new range of equipment for testing the Kelvin Hughes G.M.2 compass and periscopic sextant; and several new items of equipment ancillary to the company's well-known gyro test table.

Mr. Bryans also referred to work in connection with the production of test equipment for guided-missile components.

VAMPIRES WITHOUT WINGS

The Provost/Vampire Pilot Training Scheme in Operation

THE new R.A.F. pilot training scheme, in which pupil-pilots complete jet-flying training before gaining their wings, is now in operation. The first F.T.S. to be fully equipped with Vampires was opened for inspection last month, and those responsible for the introduction of the scheme gave their initial impressions of it.

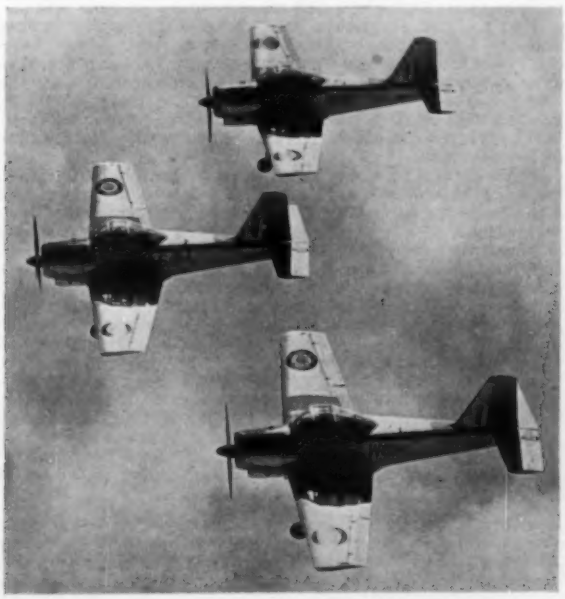
The station concerned is Oakington—No. 5 F.T.S. in No. 25 Group—commanded by G/C. C. R. J. Hawkins, O.B.E., A.F.C. Here, the first courses to be trained entirely in the Provost/Vampire sequence have been gaining their jet experience, and the first course is shortly to pass directly to its O.C.U.s. Other stations, including Cranwell, will shortly follow suit in adopting the Vampire trainer. In fact, only two stations still have Harvards —Moreton-in-Marsh and Feltwell—and the Prentice has been entirely superseded by the Provost.

The flying wing at Oakington is divided into four squadrons, Headquarters, No. 1 ("A" and "B" Flights), No. 2 ("C" and "D" Flights) and No. 3, which is in process of formation. Aircraft equipment consists of Vampire T.11s and single-seat Vampire 5s in approximately equal proportions. It is, incidentally, a further innovation that a pupil-pilot should fly a genuine single-seat fighter before receiving his wings. Though the introduction of jet aircraft to pre-wings training might at first appear to present considerable problems for pupil-pilots, no major difficulties have so far arisen. Both the T.11 and the 5 are well liked by pupils and instructors and, provided certain basic precautions are taken, there is no special risk involved. As the A.O.C-in-C. Training Command, Air Marshal Sir Lawrence Pendred, stated, sufficient "know-how" has been accumulated in four years of jet A.F.S. operation to make jet flying quite feasible for pilots of relatively limited experience. The principle more closely involved is that the pilot material should be up to jet flying, rather than that the jet aircraft should be foolproof.

Vampire Trainers peel off above the clouds near their base at Oakington.

The Provost stage of the new training syllabus was described in *Flight* on April 23rd, following a visit to No. 6 F.T.S. at Tern Hill. There the pupils complete 120 hours' basic training, before coming to Oakington—or later to other stations—for their first taste of jet flying. At Oakington they have 110 hours on Vampires before receiving their wings, and after that they are free to choose (since the majority of them are now short-service volunteers) the type of operational aircraft they wish to fly. The jet A.F.S. between wings and O.C.U. is thus to a large extent eliminated.

One of the results of the new system is that unsuitable material can be more quickly weeded out than before, with consequent saving in time and money. Before he starts flying each pilot passes through the Aircrew Selection Centre at Hornchurch and



Air Marshal Sir Lawrence Pendred, K.B.E., C.B., D.F.C., A.O.C-in-C. Training Command, with G/C. C. R. J. Hawkins, O.B.E., A.F.C., Station Commander at Oakington.

Provosts from Tern Hill make a very close "vic" over the clouds near their base. "Flight" photographs

The control tower, showing the ingenious locally made electric flight timing clock, C.R.D.F. repeater scope and communications equipment.

VAMPIRES WITHOUT WINGS . . .

then on to the I.T.S. at Kirton, where he receives his officer training and further aptitude assessment. One result of this system, and of many other factors, has been that the rate of rejection of pilots sent from Training Command to the operational commands has fallen remarkably during the last two years; it has, in fact, dropped to what must be very nearly an all-time low mark of 2 per cent. It was by this, Sir Lawrence Pendred said, that his command must in the final analysis be judged. He went on to give an illuminating definition of the type of pilot material that the R.A.F. required. It wanted young men brought up in an environment which encouraged initiative and the tradition of service to the country; they should be quick-witted, keen to fly and to fight and have the desire to take responsibility both in the air and on the ground. It should be remembered that a large part of the serving officer's time would inevitably be spent on the ground and that he would then have to manage men and organizations. Finally, a reasonable education was necessary.

Experience has taught that a number of factors are important for jet flying instruction. The ratio of pupils to instructors must not rise higher than the optimum of 2.5 to 1; over-tiredness must at all costs be avoided in both pupils and instructors; therefore no more than three sorties may be flown per day by pupils and no more than four by instructors. Physical fitness is necessary and stations have accordingly been equipped with playing fields (many stations, of course, had these already), and at least one afternoon per week is devoted to sports, one of a great variety of which is compulsory for all concerned.

For safety while flying, bad weather procedures and efficient flying control are vital. For instance, no pupil is allowed to fly at night or on cross-country exercises unless he holds a white jet instrument rating card, and considerable time is therefore initially devoted to instrument flying practice.

The control tower at Oakington is an excellent example of the type of work which goes into the operation of a jet training school. Equipment is comparable with, if not better than, that of front-line fighter stations, with C.R.D.F. homer and stand-by "steam" manual loop, separate approach-control room below the glass tower, and C.R.D.F. slave repeater in it. Furthermore, a most ingenious locally manufactured electric flight-timing clock warns the controller by buzzer when each aircraft should be called to check that oxygen is properly connected and again when the pilot should be told he has been airborne for one hour. The circuit controller also has at his elbow the telephone handset by which he can speak to the airfield crash tender by RT. This is Pye equipment which was recently ordered for the Service, and results at Oakington have been good in practices. A range of fifteen miles has been obtained.

Briefing is a vital part of all jet flights, and especially important for training. In addition to normal pre-flight briefing facilities for routine flights, a room is specially set aside at Oakington for navigation briefing. Every item of information which might be required is there clearly set out on charts for the pilots; navigational hazards, danger areas, cross-country routes and aircraft fuel consumption and endurance charts, radio procedures and facilities, "stop press" details and all the relevant call-signs which must from time to time be used.

It was evident during our visit that everything is done to ensure that each trainee is airborne equipped with the best information available on every phase of his flight. If that sorely overworked statistic, the accident-rate, may be taken as a standard of efficiency then, without contravening security regulations, one can say that all the above described measures have paid off handsomely, in a steadily declining accident rate.

The Vampire T.11 itself is well liked by both instructors and pupils. Side-by-side seating and fighter-like performance have been excellently blended with comfort and ease of handling. All important controls are duplicated, heating and ventilation are effective, and the similarity between the T.11 and the Provost cockpits most useful in initial conversion.

The T.11s at Oakington have extended fins and frameless canopies, but are not yet fitted with ejector seats. These, however, are due shortly, and when they are installed the two instrument panels will give way to one centrally mounted. Two of the four 20mm cannon provided for are carried, although, of course, no armament training takes place. During a few minutes spent in the cockpit we found the T.11 to be comfortable and the controls well placed.

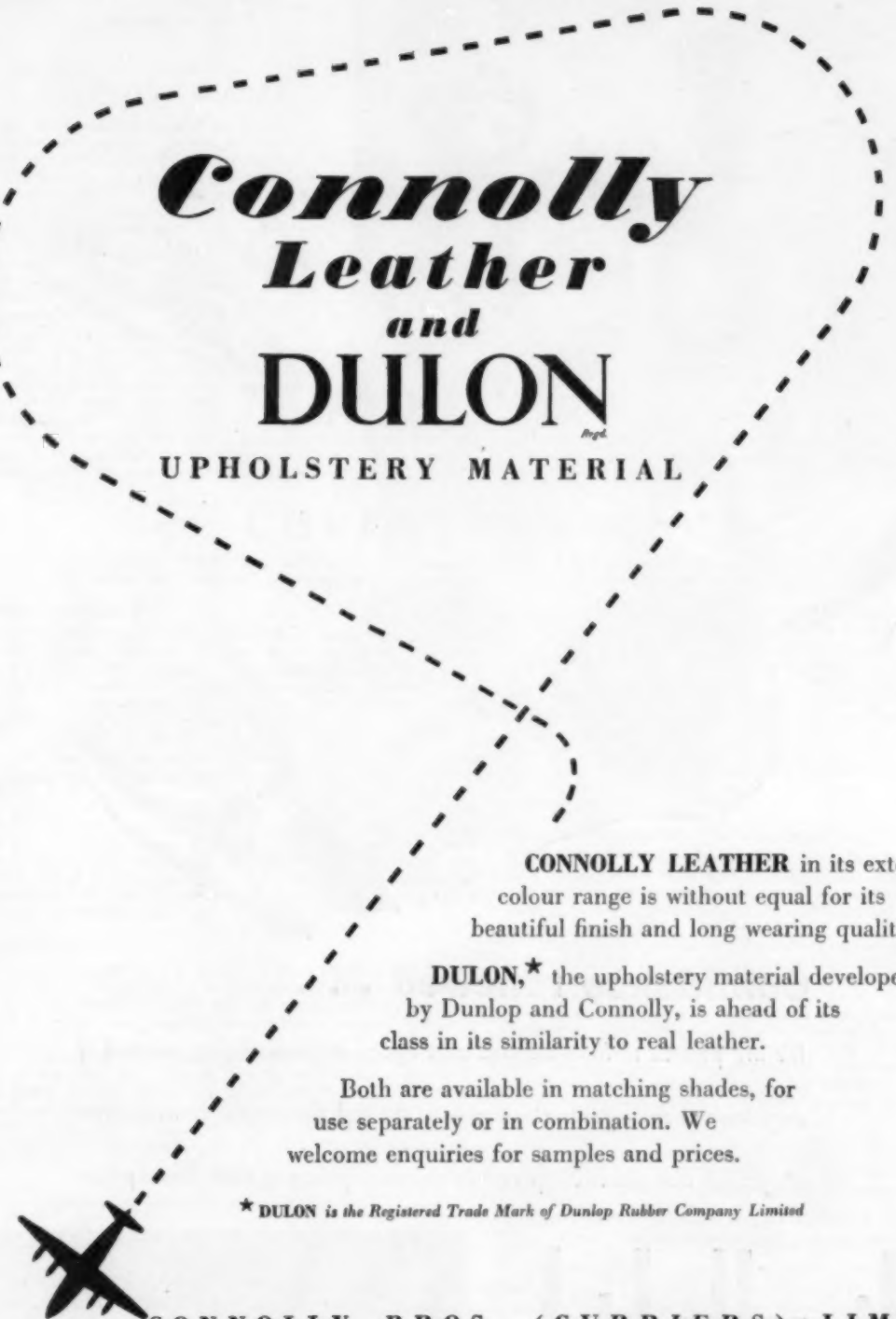
Pupils generally fly some seven hours before solo on the T.11, including stalls, spins and at least five details on circuits and landings of the various types. Care must, of course, be taken with weather at first, but, as soon as the first series of solo flights is over, instrument-flying practice begins. For this the "nun's cap" or "blinkers" type of helmet is used instead of the two-stage amber. Provost-Vampire pupils will not have gained a rating before, but 15 hours is the average time taken for an instrument rating. "Pattern B" has also given way to the "twizzle" or precision climbing turn exercise, together with limited and full-panel Mach runs and steep turns.

After the rating, which is obtained in about seven weeks, cross-countries, night and formation flying begin. Night and day navigation are carried out at low, medium and high levels, and landings made at other bases. Average length of a trip of this type is 300 n.m., taking about one hour. Both the "half-million" and "one million" scale maps are used according to the height flown.

(Left, above) A Provost, on which pilots fly their first 120 hours, seen landing at Tern Hill, Shropshire. (Below) Vampire T.11s being prepared for flight in their hangar at Oakington. "Flight" photographs

Connolly Leather and DULON Regd.

UPHOLSTERY MATERIAL



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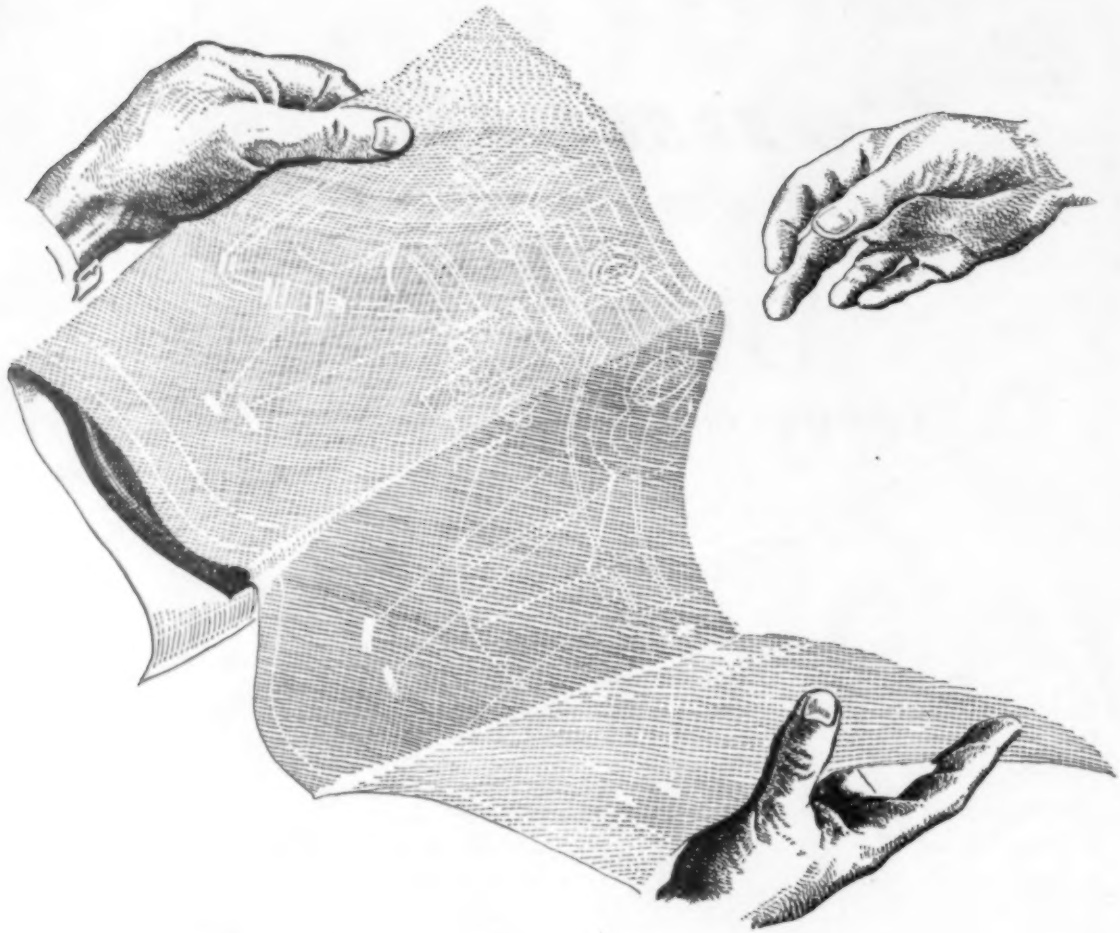

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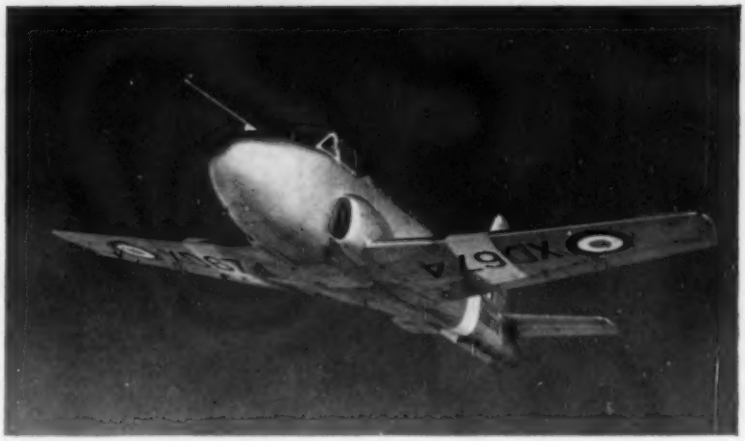
H.3

Should the jet version of the Provost go into service, flying training from the ab initio stage will be by jet-propelled aircraft.



VAMPIRES WITHOUT WINGS...

Much of the circuit work from Oakington is done at the satellite airfield at Graveley, whither the Oakington approach controller is able, incidentally, to direct or divert aircraft. Using standard No. 25 Group procedure, aircraft make controlled descents through cloud from 10,000ft down to 500ft (this latter facilitated by the very flat countryside) at 6,000 r.p.m. and 250 kt with dive brakes out; the rate of descent is about 5,000 ft/min. Alternative procedure is to use slightly more r.p.m. to achieve 4,500 ft/min. Although no G.C.A. is available, a straight-in timed approach can be made. The final item in the syllabus is 30 hours of formation flying, which is devoted to standard formations as opposed to battle and operational procedures.

Altogether, the Vampire/Provost sequence is officially considered to be working out well. The number of aircraft types has been reduced to two, while, at the same time, the end product in trained pilots has shown a great improvement. At Oakington there was an optimism and an air of efficiency which, in view of the unspeakable weather at the time of our visit, could only stem from the realization that the new scheme was working out even better than expected. C.M.L.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Security and the P.1

IN my opinion only one thing was lacking from your very fine British Aircraft Industry Number dated September 3rd, and that was a three-view drawing of the English Electric P.1 aircraft, although such drawings were given for every other modern British machine. What is more, I have noticed two or three general arrangements of the P.1 in other magazines. One of these, by the way, also featured a detailed drawing of the P.1 on its cover, a view showing the plan of the wings and tail. So far as I am aware, *Flight* has printed nothing other than two "official" views.

London, S.W.7. G. S. DRINKALL.

[We publish this letter because we have heard similar views expressed. In common with other responsible journals we are bound by a voluntary system of security—which some other publications, presenting unofficial and not necessarily accurate drawings, seem to take less seriously. We shall print further information about, and illustrations of, this aircraft as soon as it is officially permissible to do so—Ed.]

Historic Avro

THE reminiscences of Mr. A. G. Wilson about the long-forgotten Avro IU mentioned in your issue of August 27th were very interesting inasmuch as the take-off crash caused by the gross overload of grouse was probably the reason it forsook Yorkshire for Lancashire.

The machine in question was an Avro 548 with a Renault engine, owned at the time Mr. Wilson flew it, and while engaged in grouse flying, by the North Sea Aerial and General Transport Co., Ltd., of Brough, which was a Blackburn subsidiary. It was unique in being one of the only three post World War I 548s which were new Avro-built. All the rest were converted ex-military 504Ks.

The Avro 548 referred to by Mr. A. J. Jackson.

After four years with the N.S.Ae. & G. company it suffered this crash, was rebuilt and sold in February 1928 to the Lancashire School of Aviation, Ltd., at the old aerodrome at Squires Gate, Blackpool, and settled down to a long life of joy-riding. In October 1934 the Lancashire School assumed the name of its chief pilot Bill Williams and was thereafter known as Williams and Co.

This veteran of so many years of the most punishing form of aerial work was grounded at the outbreak of war and went to Hooton Park Aerodrome for storage; but, like so many other historic aeroplanes, was destroyed in a disastrous hangar fire there on July 11th, 1940.

Leigh-on-Sea. A. J. JACKSON.

No. 199 Squadron "Re-equipped"

MY copy of *Flight* takes rather a long time to get here and in consequence those articles stirring me sufficiently to write you are left either uncomplimented or unattacked. However, your publication dated June 11th, 1954, carries an inaccuracy I will not let pass.

Those people outside aviation circles know of only two types of war-time aeroplane, and the conviction exists that the Spitfire and the Lancaster carry 100 per cent of our war effort on their very capable wings.

Some of us, as you are very well aware, used equipment not quite up to top standard, and the Stirling—although not as pretty as the Lancaster—did its best. Your article "The 10th Anniversary," on page 776, has re-equipped No. 199 Squadron with Lancasters when, in fact, they were using Stirlings.

This is my first complaint in many years of reading your publication, a compliment in itself.

Djakarta, Indonesia. T. O. W. PURKIS.

[The reference in question, concerning the radar-jamming patrols flown by No. 199 prior to the Normandy landings, was quoted from material issued by the Air Ministry.—Ed.]

FORTHCOMING EVENTS

Sept. 16-17. Aerodrome Owners' Association: Annual Conference, Northampton and Sywell.
Sept. 18. R.A.F. "At Home" Day.
Sept. 25. Low-Speed Aerodynamics" Research Association: Conference on model aerodynamics (at 4, Hamilton Place, London, W.1.)
Sept. 25-26. Aero Club of Germany: Hanseatenflug international rally.
Sept. 20-29. Fédération Aéronautique Internationale: 47th annual general conference, Istanbul.
Sept. 29. British Institution of Radio Engineers: "Computing Circuits in Flight Simulators" by A. E. Cutler, B.Sc., Ph.D.
Sept. 30. R.Ae.S. Graduates' and Students' Section: "Air-to-air Photography," by Russell Adams.
Oct. 11. Institute of Transport: Presidential address by Sir Gilmour Jenkins, K.C.B., K.B.E., M.C., M.Inst.T.
Oct. 12. R.Ae.S. Section Lecture: "Behaviour of Light Alloys at Elevated Temperatures," by B. C. Gadd.
Oct. 15. Rochester Flying Club: Annual dinner and dance, Bearsted.
Oct. 15. Helicopter Association: "Application of Gas Turbines to Helicopter Propulsion," by J. Brown.

SLEEK PUGNACITY: Ten Vickers Supermarine Swifts parked tidily to await collection by Fighter Command.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Canadian Air Expenditure

OUT of a total annual appropriation of $989 million for the Royal Canadian Air Force, $140,573,000 were spent during the first three months of 1954, $36 million less than for the same period last year. The decrease is attributed mainly to less expenditure on the construction of airfields and buildings. The amount earmarked for aircraft and engines is $395 million.

St. Clement Danes

PLANS for the rebuilding of St. Clement Danes in the Strand as the Church of the Royal Air Force have now been approved by the Royal Fine Art Commission. Work is expected to start at the end of the year and to take two years to complete. The intention is to restore the building as it was after Sir Christopher Wren had finished it in 1681 and James Gibbs, his pupil, had added the steeple in 1719. Mr. W. A. F. Lloyd is the architect. A new peal of bells will be cast from the metal of the original bells.

Within the church the Air Ministry intend to build a number of shrines, and in these the names of all those fallen since the beginning of the Royal Flying Corps will be perpetuated. It is hoped that the various R.A.F. Commands will furnish pews and help in other ways to adorn the church.

New C-in-C. Mediterranean

EARLY in December next Admiral Sir Guy Grantham, K.C.B., C.B.E., D.S.O., D.S.C., is to take over the appointment of C-in-C. Mediterranean Station in succession to Admiral the Earl of Mountbatten.

Originally a submarine specialist, Admiral Grantham has held a number of appointments concerned with air matters. He commanded the carrier *Indomitable* in 1942 and served with a carrier force during the invasion of Italy at Salerno. In 1950 he was Flag Officer (Air) and Second-in-Command Mediterranean Fleet.

A.O.C. No. 62 Group

THE Air Ministry announce that G/C. Michael Harington Dwyer, who has been Senior Air Staff Officer, No. 1 Group, R.A.F. Bomber Command, since June 1952, will take up the appointment of Air Officer Commanding, No. 62 Group, R.A.F. Home Command, with the acting rank of Air Commodore, on September 22nd. G/C. Dwyer has served in the Royal Air Force since September 1931, when he entered the Service as a pilot officer on a short-service commission. He was granted a permanent commission in September 1936.

PREMIER'S INSPECTION: Sir Winston Churchill inspecting No. 615 (County of Surrey) Squadron, R.Aux.A.F., on the recent occasion when he presented the Esher Trophy to the unit. Sir Winston wears honorary Wings, presented to him by the Royal Air Force at the time of the Battle of Britain.

Iraqi Lodgers

SQUADRONS of the Royal Iraqi Air Force are operating from R.A.F. Stations Habbaniya and Shaibah, where they will remain until they can return to their permanent bases which were put out of action by the Tigris floods earlier in the year. No. 5 Squadron (Vampires) is at Habbaniya, and No. 7 Squadron (Hawker Furies) at Shaibah. These two R.A.F. airfields are maintained in Iraq under the Anglo-Iraqi Treaty of 1930. When the Tigris overflowed earlier this year, threatening to engulf Baghdad, the Iraqi squadrons moved from their base at Moascar Rashid to the Baghdad civil airport. As the floods rose to danger level, the swollen river was diverted into the shallow depression occupied by Moascar Rashid, submerging the airfield to a depth of 10ft. The Iraqi Air Staff were faced with a serious problem in providing alternative facilities for the units evacuated from Moascar Rashid, and the Commander-in-Chief, Middle East Air Force (Air Marshal Sir Claude Pelly), suggested that they should be transferred to R.A.F. stations. This offer was gladly accepted.

Reunions

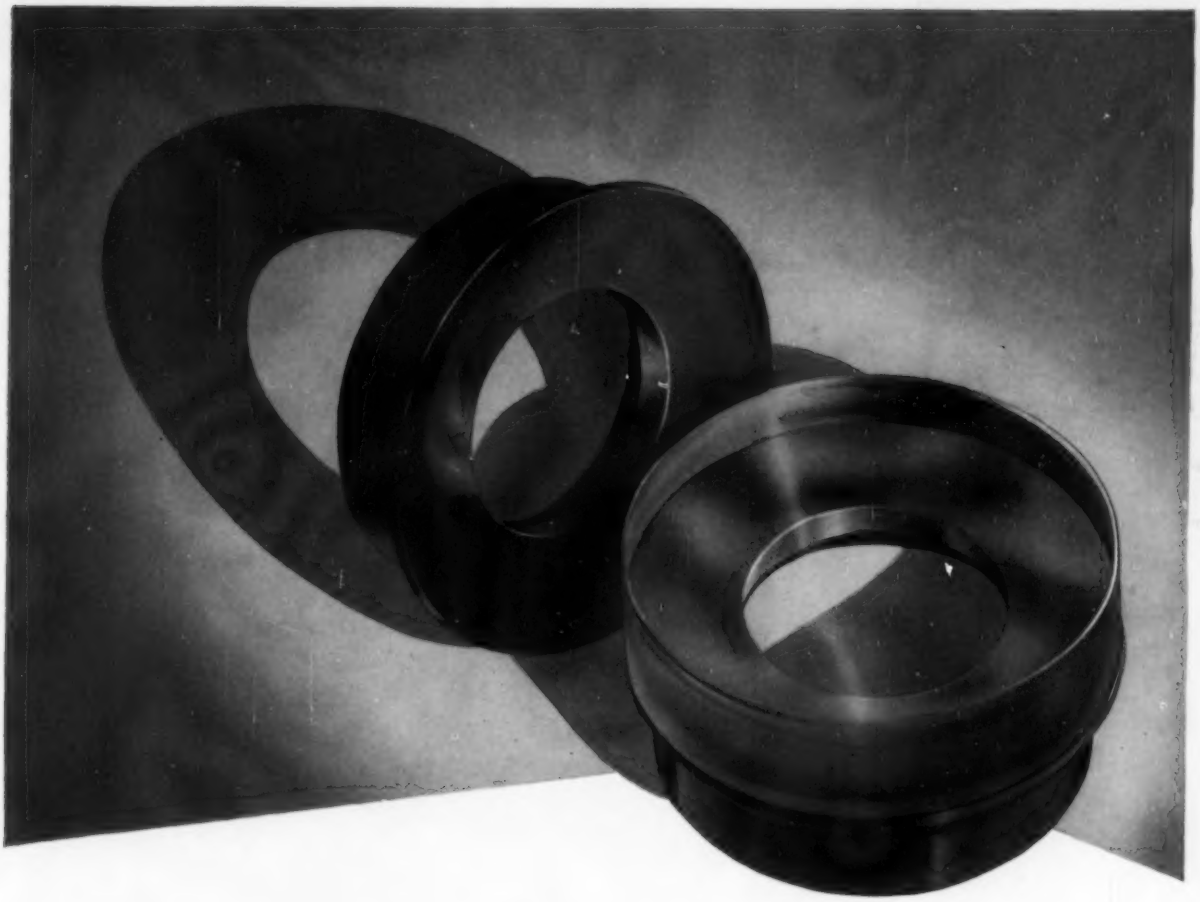
ON Saturday, October 16th, the eighth annual reunion of all members of No. 219 Squadron and No. 6219 and 6029 Servicing Echelons will be held at the Clarendon Restaurant, Hammersmith, London, at 1830 hr. Tickets (25s) may be had from S/L. D. W. B. Farrar, D.F.C., A.F.C., Air Ministry, Room 3371, Whitehall Gardens, London, S.W.1.

* * *

The Swiss Hotel, Old Compton Street, London, W.1, is the venue for the reunion of No. 150 Squadron on Saturday, October 16th at 1830 hr. Tickets (6s 6d) from L. E. Hodgson, 12 Waldegrove Road, Bickley, Kent.

* * *

A combined reunion for No. 254, 236 and 143 Squadrons will be held on Saturday, October 23rd, at the Paviours Arms, Page Street, Westminster, London. Those wishing to attend should contact G. H. Webb, 48, Hendham Road, London, S.W.17. (Telephone BALham 5337).



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CIVIL AVIATION

B.O.A.C. ACQUISITIONS

RECENT additions to the strength of B.O.A.C.—and to the British Civil Register—are Stratocruiser G-ANUM and Constellation G-ANTG. The Stratocruiser, which arrived at London Airport on September 3rd, is one of two bought from P.A.W.A.; its previous registration was N 1027V *Clipper Friendship*. Delivered 13 days earlier, the Constellation is the second of four Model 749As from Qantas Empire Airways; it was formerly designated VH-EAE *Bert Hinkler*.

NEW SERVICES APPROVED

THE Minister of Transport and Civil Aviation, after considering the recommendations of the Air Transport Advisory Council, has approved the operation of the following air services:—

(i) A vehicle ferry service between Southend and Calais: Air Charter, Ltd., until June 30th, 1961. (ii) A normal scheduled service between Southampton (Eastleigh) and Deauville; Flightways, Ltd., until February 29th, 1956. (iii) An internal service between Liverpool (Speke) and Pwllheli (Broomhall), and (iv) an internal service between Manchester (Ringway) and Pwllheli (Broomhall) *via* an optional traffic stop at Liverpool (Speke); Dragon Airways, Ltd., until September 30th, 1960.

The Minister has also approved the following applications for amendments to air services:—

(a) The optional extension to Leicester East of internal services between Birmingham and/or Jersey, and (b) the optional extension to Coventry of internal services between Wolverhampton and the Isle of Man by Don Everall (Aviation), Ltd., (c) the operation of Dakota aircraft during the summer only on internal services on the route Liverpool-Cardiff and/or Bristol-Guernsey and/or Jersey by Cambrian Air Services, Ltd. (To be operated once daily on Fridays, Saturdays and Sundays at the discretion of the company in place of all flights on those days by other authorized aircraft.)

APPRENTICES AT L.A.P.

NEXT year will see the "graduation" of the first products of the B.O.A.C. boy apprenticeship scheme, which started in 1950, and now has an annual intake of between 65 and 70 a year. Designed to give a thorough training to potential engineers, it consists of a five-year course, the latter part of it spent at London Airport.

Those training in the category engines/airframes, for instance, are given three years at the de Havilland factory, the Bristol Aeroplane Company's works or the R.A.E. at Farnborough, followed by two years at London Airport. Instrument repairers spend a year at Northampton Polytechnic and four at L.A.P.

Aircraft electricians have two years at a Ministry of Supply Royal Ordnance Factory, near Crewe, followed by three at the airport, and boys training in radio maintenance have two years with Marconi's Wireless and Telegraph Co., Ltd., or the Ultra Electric Co., Ltd., and three years' subsequent training at the airport. Total number of apprentices now under training is about 150.

LIVELY GIANT: This spirited Britannia study shows G-ANBA, the first of 15 Mk 100s for B.O.A.C., and was secured during the new aircraft's 45-minute maiden flight on September 5th.

S-55s FOR THE CONGO

FROM Leopoldville it is reported that Intair, Ltd., acting for the Government of Belgian Congo, have contracted with United Aircraft Export Corporation for delivery by early 1955 of three Sikorsky S-55 helicopters fully equipped for night flying and amphibious operations. Total cost of the aircraft, plus spares, is given as $456,000 (£162,850). The S-55s will succeed the three Westland S-51s which are being so successfully flown by Sabena Airlines in the Government's Lower-Congo health campaign.

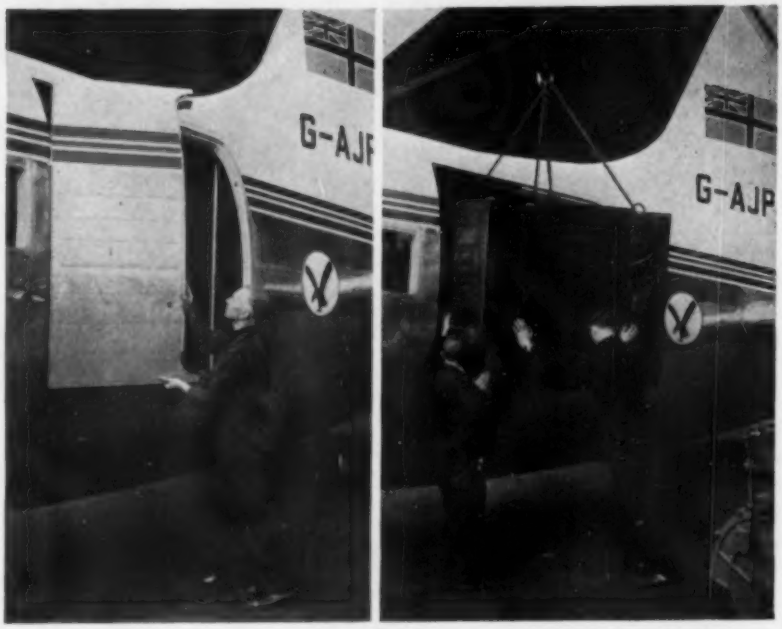
The larger, longer-range S-55s required for operations further afield, will also be operated and maintained by Sabena. It is confidently expected that this new action of the Belgian Congo Government will have the same success in the provinces as around Leopoldville where malaria, for instance, has been practically eradicated by the S-51s; the latter helicopters, incidentally, are being offered for sale by Intair.

HANDSOME COUPLE: Two graceful shapes cruising above the overcast—the Comet 3 prototype (foreground) and a production Comet 2.

FF

CIVIL AVIATION . . .

VIKING FREIGHTER: As reported below and illustrated on the right, Eagle's latest Viking can be quickly adapted for freighting duties by the removal of a bolted panel on the left of the main passenger door. The door itself, which hinges on this panel, is also removed, leaving a hatch of just over 5ft square.



FROM JETS TO PISTONS

EXTERNALLY, there is little to distinguish G-AJPH from the nine other Vikings operated by Eagle Aviation, Ltd. Only the registration provides a clue to the unusual history of this aircraft, which was in fact the first airliner to fly solely on jet power.

The work of converting the highly experimental Nene-Viking to a standard Hercules-powered Viking 1B has been performed at Blackbushe by Eagle Aircraft Services, Ltd. Its successful completion, a few days ago, has added a virtually new aircraft to the Eagle fleet at comparitively low cost and, incidentally, has confounded a few sceptical forecasts as to the practicability of such a conversion.

Built to Ministry of Supply contract to investigate problems associated with jet transports, G-AJPH made its first flight on April 6th, 1948. Its airframe was one of the last built by the Viking production line at Weybridge and, being planned to take two Rolls-Royce Nenes at the outset, embodied a number of non-standard features. Special under-slung nacelles and a new twin wheel undercarriage were fitted, fuel was carried in flexible tanks outboard of the engines and a strengthened tail permitted the aircraft to fly at true air-speeds of over 400 m.p.h. The Nene-Viking's first appearance was on July 25th, 1948, when it flew from London Airport to Villacoublay, Paris and back, averaging nearly 400 m.p.h. It also took part in the S.B.A.C. Show the following September, but its career as a development aircraft was otherwise devoid of highlights.

When Eagle bought the Nene-Viking from the Ministry of Supply in November last year it had flown a total of only 168 hr, which must be easily the shortest flying life of any Viking in existence. The first step was to remove the Nenes, which were sold to Handley Page, Ltd., for use in a new wind tunnel. Conversion to normal Viking standards has entailed a good deal more than simply replacing the turbojets with Hercules 634 piston engines. New tail surfaces had to be fitted, the special undercarriage replaced by standard units, instrumentation and radio completely changed and a normal fuel system installed. G-AJPH now has Eagle's standard "Mayfair" interior with attachments for 36 seats. In addition an ingenious rear-door modification allows the aircraft to be used as a freighter; this modification, which was developed and carried out by Eagle Aircraft Services and has been approved by the A.R.B., was embodied for the first time in the dual-purpose Viking sold recently to the King of Jordan.

The dimensions of the main passenger door of the Viking (62in high by 36in wide) make it unsuitable for loading of bulky consignments. The manner in which Eagle have overcome this problem is shown by the accompanying illustrations. The extra door, normally secured by a series of bolts, can be removed in about ten minutes, leaving a hatch of over 5ft square to omit large freight loads. It is expected that other aircraft of the Eagle fleet will be similarly modified, and Eagle Aircraft Services may also be requested to fit the freight door to the Vikings which they are now offering for sale to other operators.

THEN AND NOW: Viking G-AJPH is shown below as it first appeared in 1948, with Nene turbojets and the temporary military serial VX 680, and as now modified to a Hercules-engined Viking passenger-freighter by Eagle Aircraft Services.

BREVITIES

THE 22nd Viscount route record was set up on September 6th, when Flight BE 472, commanded by Capt. Derek Mason, covered 476 miles between London and Hamburg in 1 hr 35 min —a block speed of 301 m.p.h.

* * *

American Airlines report a 9 per cent reduction in operating mileage and a 7½ per cent reduction in staff as a result of the recent 25-day pilots' strike. Among the 1,300 employees being dismissed are 122 co-pilots and 38 flight engineers.

* * *

Following a number of experimental flights made in September 1953, Compagnie Cherifienne du Pont Aerien have opened a Bristol 170 ferry service between Araoua, French Morocco, and Jerez de la Frontera, Spain. In July, the company reports, the service carried 91 cars, 10 motor cycles and 421 passengers.

* * *

Hunting-Clan Air Transport, Ltd., have announced the appointment of Lt. Col. D. G. Hughes as their special representative for Africa. From his base in Nairobi, Col. Hughes will be concerned with planning and developing his company's operations throughout Africa.

* * *

On September 1st Mr. R. L. G. Borgerhoff-Mulder relinquished his appointment as general manager (U.S. and Ireland region) for K.L.M. Pending the return to this country early next year of Mr. W. De Mier, who went to Central America 18 months ago to open up K.L.M.'s new organization in that area, Mr. M. J. P. van der Heyden has taken office as acting general manager.

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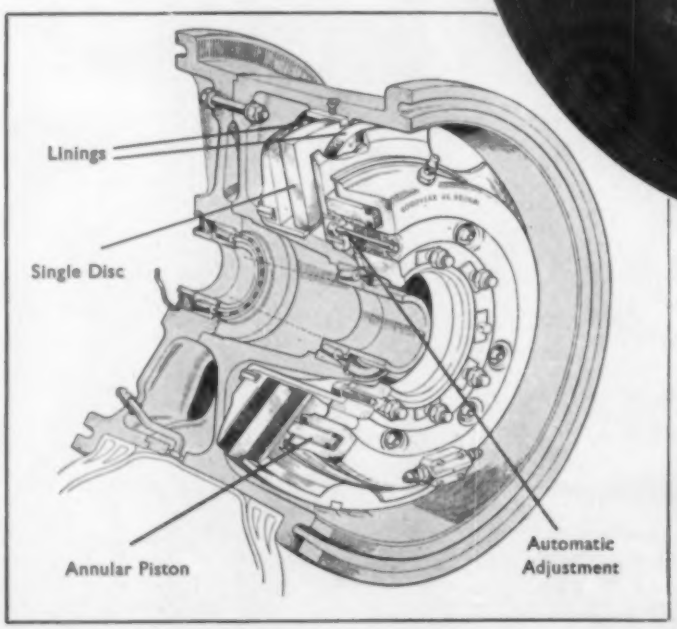

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FROM THE CLUBS

FOR some years past the flying clubs at Wolverhampton and Derby have held their annual competition days, on which members exercise their talents in the various arts of flying, but Sunday, August 29th, was the first occasion on which Elstree Flying Club (the youngest member of the Air Schools Group) attempted such a function.

A surface wind of some 15 kt or more disheartened many competitors before the start of operations, but for the judges this provided a very sound medium for testing the candidates' abilities. All the tests ran concurrently and, with the exception of one in map-reading, were confined almost entirely to work in or near the circuit.

The landing competition (three-point touchdown and spot-landing) was won by G. Moore, who also won the circuit contest, in which pilots were tested on their airmanship, checks and vital actions, take-off, circuit, approach, full-flap overshoot from the ground, a further circuit and a landing.

For the map-reading test, candidates were handed a map on entering the cockpit, and were then called upon to fly to five selected but inconspicuous pin-points—carrying the judge aboard the aeroplane. The winner, V. Edwards, deserved special congratulations as, through illness, he had been unable to fly at all during the previous six months.

Technical knowledge is often a weak number among amateur pilots, so an oral test divided into three sections (theory of flight; airframe and engines; meteorology and general) served a useful purpose in discovering whether members were keen enough to bother with anything other than the "pure flying" side of the game. Obviously some were not, but C. Vernon left the examination room with a very creditable 77 out of 80.

Finally, student pilots were judged on the same basis as were the P.P.L. holders in the circuit contest, and the original results were close enough to necessitate a re-test later in the day; P. S. Jaffray came out top for being the most consistent.

Unfortunately, an instructors' handicap race had to be abandoned owing to last-minute unserviceability with one of the Maggies, but the remainder of the trophies were handed to their winners and, during the course of the evening, plans were discussed for future events. These included a competition for private owners and a contest between the private members and those of the Handley Page Works Flying Scheme, which is operating very successfully from Elstree. Although it was formed only four months ago its members qualified for two of the six cups and one, C. Vernon, was runner-up for the Club Championship. This, for the pilot gaining the highest total number of points, went very deservedly to George Moore, who now becomes (in the words of C.F.I. David Ogilvy) "Elstree's most respected person for 1954!"

STILL instructing at the Southern Aero Club at Shoreham, after more than 40 years as a flying instructor, is Cecil L. Pashley, the club's C.F.I. and one of the best-known of this country's surviving aviation pioneers. His flying career started in 1908 at Hockley, Essex, with flights in the biplane glider built by Charles Lane; he subsequently commenced power flying, teaching himself on the 25-h.p. Anzani-Blériot, the Humber monoplane, and the Farman Voisin, and Sommer biplanes. He joined the Universal Aviation Company in 1911, and continued to fly the Sommer biplane.

Cecil Pashley, who—as related here—has been a flying instructor for over 40 years.

Cecil Pashley and his brother Eric opened a flying school (Pashley Brothers and Hale) in May 1913 at the new aerodrome of New Salts, Shoreham. Their aircraft was a Henri Farman (50 h.p. Gnôme). An interesting venture was the design and construction of the Pashley brothers' pusher biplane fitted with a 50-h.p. Gnôme. This machine was built for competition flying and, within a few days of completion, won its first race for the Shell Cup at the opening of the 1914 season. The outbreak of war prevented the completion of a 100-h.p. Gnôme version.

At the outbreak of World War 1, Shoreham aerodrome was taken over by the War Office and in March 1915 Cecil Pashley was at Windermere Flying School, flying seaplanes as part of his instructional work. He then became an Admiralty-approved test pilot, moving to Hendon and testing the R.N.A.S. output of the Grahame-White Aviation company. This busy period also entailed the training of a very large number of R.F.C. and R.N.A.S. pilots.

In 1920 Pashley obtained his B licence, endorsed for instructing, and a period of flying for the Central Aircraft company at Northolt followed. He returned in 1922 to the familiar surroundings at Shoreham, this time in partnership with F. G. Miles—and, incidentally, teaching him to fly. He became pilot-director of the Gnat Aero Company, later renamed Southern Aircraft, Ltd., in 1925, at the same time founding, with Miles, the Southern Light Aeroplane Club (subsequently the Southern Aero Club).

During the active days of private flying in the 1930s, C.F.I. Pashley was kept busy teaching people to fly at Shoreham. The ever-reliable Avro 504K was in use for training until as late as 1934. By 1935 the airfield had become the Brighton, Hove and Worthing municipal airport. The friendly little Southern Aero Club was now the South Coast Flying Club, controlled by Brooklands Aviation, Ltd.

During World War 2, Pashley was called-up in the R.A.F.V.R. and instructed at Sywell (No. 6 E.F.T.S.) before going out to Southern Rhodesia under the Empire Air Training Scheme and instructing on Tiger Moths and Cornells at Mount Hampden (No. 28 E.F.T.S.) and Thornhill. For his war-time services, which added some 3,300 hours to his flying time, he was awarded the M.B.E. and the A.F.C.

After the war, Cecil Pashley returned once again to instructing at the airfield with which his name is so inseparably connected. The Miles Company also returned to Shoreham some three years ago. With the renewal of this firm's association with Pashley, the wheel had turned full circle in 28 years.

In over forty years of instructing, Pashley has logged some 17,000 flying hours—a total all the more remarkable considering that he has not been engaged on airline work at any time.

LONG-DISTANCE LEAVE

A TEN-THOUSAND-MILE out-and-return flight between Northern Germany and Southern Rhodesia in a Miles M.18 light aircraft was recently made by two R.A.F. officers during their summer leave period. The pilot was F/L. H. B. Iles, owner of the M.18 (G-AHKY) and son of A.V-M. L. M. Iles, C.B.E., A.F.C., and his navigator was F/O. R. H. Sanderson, a Rhodesian whose home is in Bulawayo.

Both officers are based at the R.A.F. station at Jever, and are members of 93 Squadron. From Jever, their ten-day outward trip was made by way of Bremen, Munich, Italy, Greece, Cairo, Khartoum, along the Nile to Misumu and *via* Tanganyika to Bulawayo. With them they carried a shield bearing the squadron's crest to be presented to the Southern Rhodesian Air Force from the C.O. at Jever on behalf of the station.

After a two-week stay in Bulawayo, where F/O. Sanderson's father is parish priest of St. Mary's Protestant Cathedral, another fortnight was being allowed for the return flight, estimated to take about 55 flying hours (as on the outward trip). Iles and Sanderson landed at Jever on August 30th, six weeks after their original take-off.

Before departure, F/L. Iles (holding plaque) and F/O. Sanderson (left) talk with G/C. Powell-Shedden, D.S.O., D.F.C. (station commander) and S/L. R.N.G. Allen, D.F.C. (No. 93 Squadron commander).

THE AERONAUTICAL BOOKSHELF

"V.2.," by Major-General Walter Dornberger. Hurst and Blackett, Ltd., Stratford Place, London, W.1. Illustrated. Price 16s.

AFTER a spate of books by over-optimistic space-flight enthusiasts, promising journeys to the Moon within a few years, it is good to read this down-to-earth story of the development of the forerunner of all space-rockets. General Dornberger, who was in charge of rocket research and development for the German Army at Peenemunde during World War II, makes no attempt to belittle the problems and set-backs that were encountered with the V.2 project, which was relatively simple compared with the perfection of a manned space-ship or even an unmanned earth satellite vehicle.

Admittedly, the difficulties which beset Dornberger and his fellow-scientists and engineers were not all technical. The first V.2—or, to give it its correct designation A.4 ("Aggregate 4"), was launched on October 3rd, 1942. Then one of Hitler's celebrated dreams told him that no rocket would ever reach London, and he issued an edict that resulted in all priorities of labour and material being withdrawn for several months. Even Bomber Command's great attack on Peenemunde in August 1943 probably delayed the project less than the later machinations of Himmler, who ordered the removal and arrest of key technicians; or the interference of people like Dorsch of the Todt organization, who persuaded Hitler to order great concrete launching sites for V.2 instead of the less vulnerable, easier-to-build mobile batteries favoured by Dornberger.

Despite every hindrance, and the insistence of the Peenemunde scientists that the weapon was not yet ready for operational use, the V.2 offensive on London started in September 1944. Each rocket carried a ton of explosive nearly 200 miles, with a reasonable degree of accuracy. Some 20 per cent were beam-guided. By comparison, the best performance ever achieved by gunnery had been with the enormous Paris gun during the 1914-18 war, which could fire a 210 mm shell with 25 lb of explosive about 80 miles. But V.2 was not able to help turn the tide of battle, because the war was already lost for Germany before it was ever used in action.

This story of its development is very readable and, although rocket enthusiasts will complain that it contains insufficient technical data, there are scores of new and intensely interesting facts about this and other products of the Peenemunde scientists. There are details of the first liquid-propellent rocket motor fitted to an aircraft—a 650lb-thrust unit mounted under the fuselage of a wingless Junkers Junior in the spring of 1936; of a rocket-propelled 5g centrifuge built soon afterwards; of the first flight tests of a 2,200lb-thrust controllable rocket in a Heinkel He 112 in 1937; and of the first rocket-fighter, the He 176 of 1938.

Brief details are given of other wartime projects, including the 450ft long "Busy Lizzie" constant-pressure rocket-gun; the *Wasserfall* anti-aircraft rocket; and the *Rheinbote* artillery rocket, 200 of which were launched against Antwerp in 1945. Even more interesting is Dornberger's description of experiments in which 20 explosive-carrying rockets were launched simultaneously from a submarine submerged at a depth of 30-50ft, and of plans to tow V.2s in special launching canisters behind U-boats.

Most valuable of the illustrations are those showing A.3, A.4, A.4b and *Wasserfall* rockets under test at Kummersdorf and Peenemunde—the first of them in 1936!

"Slide Rule," by Nevil Shute. William Heinemann, Ltd., 99 Great Russell Street, London, W.C.1. Illustrated. Price 18s.

AS an autobiography of one of our most entertaining novelists, this book is a little disappointing. Either Mr. Shute has had a not-very-exciting private life, or he prefers not to write about it—probably the latter, because there is, for example, no account of his post-war flight to Australia and back with James Riddell in a Proctor, which was described so brilliantly by his passenger in *Flight of Fancy* (Robert Hale).

There is, however, a great deal that will interest the aviation fraternity, because much of *Slide Rule* is concerned with the ill-fated R.100 and R.101 airship programme of 1924-30 and the early years of Airspeed, Ltd., which Nevil Shute Norway (the author's full name) founded with a few friends, little capital and a promised order for two ten-passenger Ferry transports for Sir Alan Cobham.

Readers who are too young to remember the big airships of the twenties and thirties will be surprised to learn of the luxury of their interiors. An entry in the author's diary, describing a flight in the R.100, records: "Sleep all night in bed, get up, shave in hot water, dress and eat a normal breakfast served in a Christian way. If this water collector can be developed, we may be able to have baths in future ships." And it is still somewhat startling to be reminded that the R.100 set out on a successful two-way Atlantic crossing after making only seven test flights.

Mr. Shute's description of the building and testing of the Vickers-designed R.100 is first-class, and he emphasizes some of the safety characteristics of airships, especially their ability to descend very slowly and surely in bad visibility. But he also gives the other side of the picture, when recalling the R.100's behaviour during a storm. At one stage she rose at the rate of 4,000 ft/min, although 20 deg nose-down, and sustained twelve-foot tears in the fabric of her fins.

The story of the Cardington-built R.101 is even more depressing; but the author pulls no punches in claiming that this aircraft was poorly designed, inexpertly flown and fore-doomed by the fact that its whole development and despatch on a premature flight to India were dictated by civil servants whom he describes as "arrogant fools." Mr. Shute kills any ambitions your reviewer might have had to fly in a rigid airship.

Less controversial, but no less interesting, are the chapters concerning Airspeed, Ltd. In these days of seven-year development periods it is sobering to read that the first Airspeed Ferry was completed at the end of March 1932, passed its official flight tests at Martlesham Heath in four days and was operating with Sir Alan Cobham's National Aviation Day "air circus" by the third week of April. In the next three months it did 600 hours' flying and carried 36,000 paying passengers. Extremely entertaining tales are told of how many of the company's unsold Couriers and Envoys finished up in Spain during the Civil War, and so virtually saved Airspeed from financial ruin, until the fast-approaching world war brought large orders for Oxford trainers.

Before that, in 1936, the Air Ministry ordered two small prototype machines called Irving biplanes. They were never built, but are of interest as they were intended for the unique rôle of mobile barrage-balloon cables. Flown by over-age or women pilots, they were planned to cruise along in great numbers just above the clouds, trailing 2,000ft of steel cable from power-operated winches!

With so much to look back on, there is little wonder that Nevil Shute ends his book with the remark that: "once a man has spent his time in messing about with aeroplanes he can never forget their heartaches and their joys, nor is he likely to find another occupation that will satisfy him so well, even writing novels."

"The Helicopter and How It Flies," by John S. Fay. Sir Isaac Pitman and Sons, Ltd. Illustrated. Price 10s 6d.

TO those familiar only with fixed-wing theory, the aerodynamics of the helicopter are apt to be puzzling. The intricacies and subtleties of what might be termed the by-products of control movement, and of such things as drag hinges and dampers, are not immediately or easily understandable; and, once the student has fathomed the aerodynamic forces and moments produced and counteracted in flight, there remains a great deal more to be learned about the mechanical side of these matters.

In *The Helicopter*, Mr. Fay (an experienced pilot) has produced a simple and progressive explanation of rotating-wing aerodynamics which is lucid and yet entirely free from formulæ or intimidating figures. He has dealt with all the conditions of flight, of control, of stability and of the peculiar behaviour of rotor blades under a great variety of conditions, and his explanations have been admirably illustrated by Lucy Raymond. Simple treatments which are also technically reliable are all too rare; Mr. Fay's book is likely to be an exception proving the rule.

OTHER BOOKS RECEIVED

Tiger Squadron, by W/C. Ira ("Taffy") Jones. W. H. Allen and Co., Ltd., 43 Essex Street, London, W.C.2. Price 15s.

Electrical Ignition Equipment, by F. G. Spreadbury. Constable and Co., Ltd., 10 Orange Street, London, W.C.2. Price 25s.

Frigate Bird, by P. G. Taylor. Angus and Robertson, Ltd., 105 Great Russell Street, London, W.C.1. Price 15s.

Component Design (Handbook of Aeronautics, No. 2, published under the authority of the Council of the Royal Aeronautical Society). Sir Isaac Pitman and Sons, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2. Price 30s.

Airplane Structures, by A. S. Niles and the late J. S. Newell. Chapman and Hall, 37 Essex Street, London, W.C.2. Price 62s.

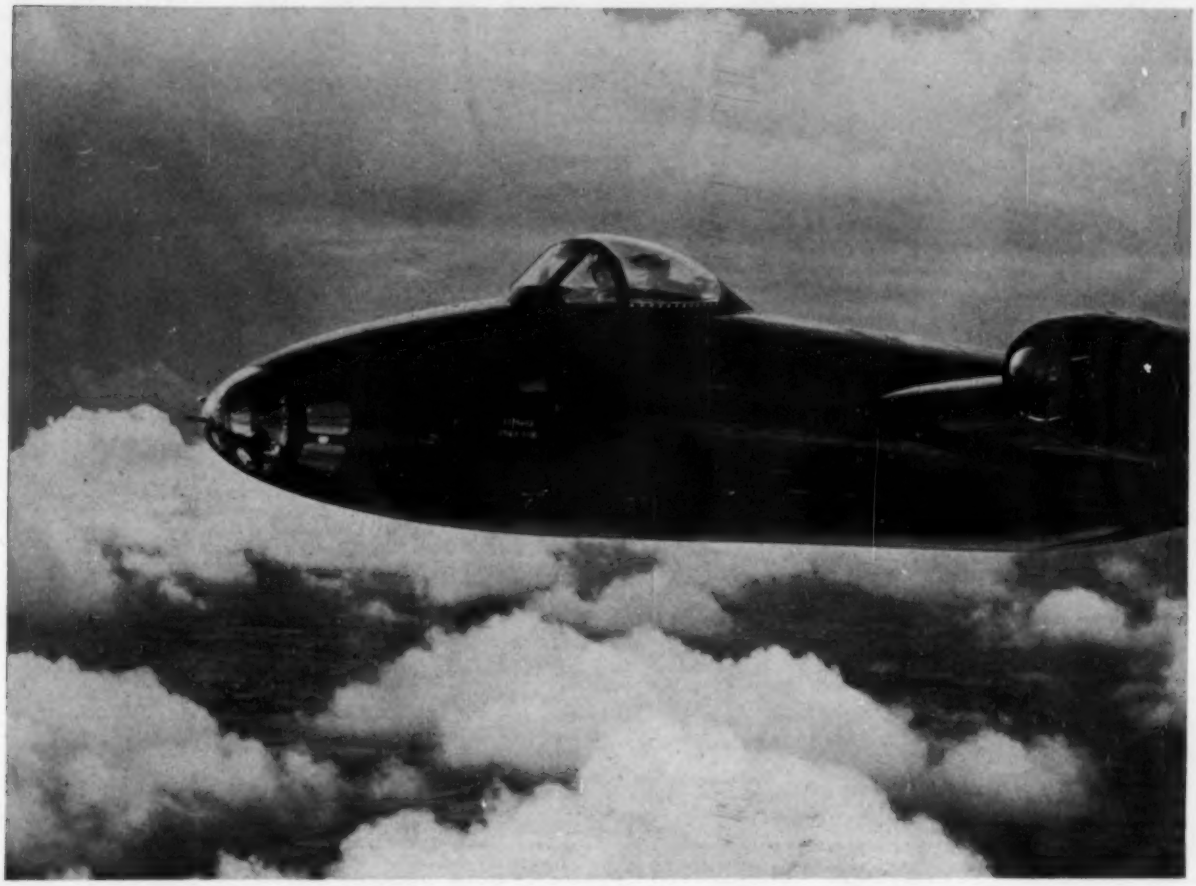
Sound Barrier, by Neville Duke and Edward Lanchberry. (Revised and enlarged edition.) Cassell and Co., Ltd., 37/38 St. Andrew's Hill, London, E.C.4. Price 8s 6d.

The Dangerous Skies, by A. Cdre. A. E. Clouston. Cassell and Co., Ltd. Price 13s 6d.

A Selection of Graphs for use in Calculations of Compressible Airflow, prepared on behalf of the Aeronautical Research Council. Oxford University Press, Amen House, Warwick Square, London, E.C.4. Price 84s.

Aircraft Recognition Manual, by C. H. Gibbs-Smith. Putnam and Co., Ltd., 42 Gt. Russell Street, London, W.C.1. Price 10s 6d.

Royal Air Force 1939-1945, Vol. III, The Fight is Won, by H. St. G. Saunders. H.M.S.O. Price 13s 6d.



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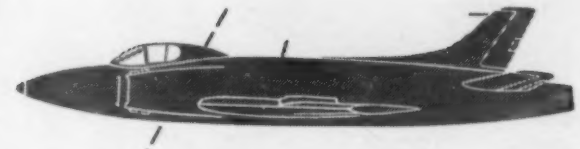

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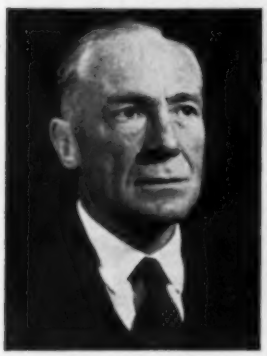
OFFICE FRONTAGE of the new overhaul base just completed at Mascot, N.S.W., by Rolls-Royce of Australia; behind lies 45,000 sq ft of works area, plus two test-beds. A Dart engine will be running, to prove the installation, before the first T.A.A. Viscount arrives. Manager and chief engineer is Mr. A. H. Harvey-Bailey. This photograph has become available since our recent Commonwealth Aircraft Industries Number was published

THE INDUSTRY

Liaison Officer for Short Bros.

FROM Short Bros. and Harland, Ltd., comes an announcement of the appointment of Captain (E) P. D. Oliver, C.B.E., M.I.M.E., R.N.(Retd.), as liaison officer to H.M. Services and to the fighting services of friendly powers equipped with aircraft of Short design or manufacture. Born in 1900, Captain Oliver was educated at Rugby and joined the Navy in 1918. He specialized in engineering and in 1925 became a Fleet Air Arm pilot. In 1939 he was in the Department of Aircraft Maintenance and Repair at the Admiralty, and in 1941 was appointed Chief Engineer and Air Engineer Officer in H.M.S. *Unicorn*. This ship, built at Belfast, was the first of her kind; she combined the rôles of aircraft carrier and aircraft repair ship. Captain Oliver left *Unicorn* in 1944 to join the staff of Flag Officer Air (Home) as Technical Training Officer. He was Fleet Engineer Officer (Home Fleet) from 1947 to 1949 and afterwards became Chief Staff Officer to Rear Admiral, Reserve Aircraft. His last active appointment in the Royal Navy was as Superintendent R.N. Aircraft Maintenance Yard, Sydenham, a post which he held from 1951.



Capt. P. D. Oliver.

Course in Press-tool Making

THE City and Guilds of London Institute has announced courses and examinations in press-tool making. The scheme has been prepared by an advisory committee which includes representatives of a number of institutions and associations including the S.B.A.C.

The committee, says the Institute, has had particularly in mind the needs of apprentice toolmakers specializing in the making of press tools. It is envisaged that students will attend part-time courses extending over five years. The first two or three years of the course will be occupied by preparation for the City and Guilds Intermediate examination in machine shop engineering, and the last two or three years will be taken up by the special course. The curriculum of the latter comprises press-tool technology; press-tool workshop practice, and science, calculations and design appreciation.

The scheme comes into operation in the technical college session beginning this month, and the first examination in press-tool making will be offered in 1956. Full details may be obtained in a pamphlet (No. 186) price 6d. from the Department of Technology, City and Guilds of London Institute, 31 Brechin Place, South Kensington, London, S.W.7.

New Instrument Company

A NEW company formed in this country under the title of Giannini, Ltd., is an affiliate of G. M. Giannini and Co., Inc., the American instrument and control manufacturers of New York, with factories at Pasadena, California, and East Orange, N.J.

The parent company was formed in 1935 by Mr. Gabriel Giannini, as holders to administer certain patents for the use of radio-active substances. Since 1944, however, the company has been active in the development and manufacture of instruments, particularly for guided missiles and automatic controls. The present range includes accelerometers, pressure-heads, gyros, pressure transducers and switches, and a comprehensive range of potentiometers.

A recent Giannini development has been in digital-type data-transmission and printing equipment, which reads mechanical movement and operates recording or card-printing machines, for example, Hollerith machines.

The new company intends to negotiate licences for the manufacture of equipment to Giannini designs for the British Commonwealth and Empire, excluding Canada. The directors are Mr. Christopher Dykes, a well-known advising aeronautical engineer, who has been U.K. adviser to G. M. Giannini and Co. for the last two years, and Mr. Bernard Sutton, of Frere, Cholmeley and Nicholsons, solicitors. Enquiries should be made to Mr. Dykes, at 31 Pembroke Gardens, London, W.8 (Western 9493).

For Clean Fuel Supplies

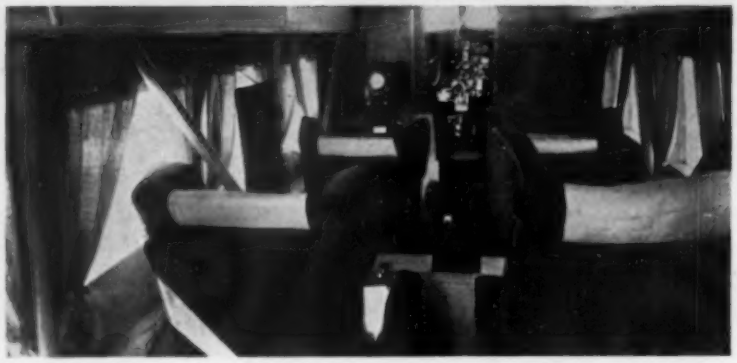
INTRODUCTION of a new bulk filter for aircraft refuelling tankers, airfield pipeline systems and engine test-bed installations is announced by Automotive Products Co., Ltd., of Leamington Spa.

Designed and developed for full-flow filtration of the light hydrocarbons, this new "Purolator" filter consists of a steel outer casing of welded construction designed for a normal working pressure of 100 lb/sq in and suitably treated to resist rust and corrosive action. The casing contains eight "Micronic" filter elements, constructed of plastic impregnated paper, which are waterproof, heat-resistant and capable of removing contaminants (measured in microns) at relatively high rates of flow. The design of the element provides an unusually large filtering surface in proportion to its volume, the paper being pleated around a central metal former. The elements are normally replaced when a difference of 15 lb/sq in is recorded on the pressure gauges at the inlet and outlet of the casing. Maximum capacity is 200 gal/min, height (less gauge) is 21¼in, and overall width is 22.5in.

"Chris" Clarkson's New Post

IT is learned that Mr. Christopher Clarkson, who was civil air attaché at the British Embassy in Washington from 1948 until 1951, has been appointed representative of Vickers-Armstrongs, Ltd., in the United States. He will have offices at 10 Rockefeller Plaza, New York. Vickers-Armstrongs, it will be remembered, have recently received orders, from Capital Airlines and Trans-Canada Air Lines, for a total of 62 Viscounts. Mr. Clarkson, who has had more than 30 years' experience in aviation, and flown more than 180 different types, served in the Royal Air Force during World War II, chiefly on test-flying duties, and attained the rank of group captain. Educated at Lancing College, Mr. Clarkson served initially with the R.A.F. between 1924 and 1929, qualifying as an instructor with the Central Flying School. He was R.A.F. representative with the British Air Commission in New York between 1940 and 1944 and Chief of the Test Branch, British Air Commission, in Washington from 1944 until 1946. Since 1952 he has been U.S. representative for various British aviation companies in New York.

Mr. Christopher Clarkson.



LABORATORY AND SHOWROOM: An Anson XI, recently acquired by E. K. Cole, Ltd., for use as a flying laboratory, has been fitted with Ekco airborne search radar (note the scanner nose) and was operated from Blackbushe during the show period in order to demonstrate the equipment. The two views on the left show the indicator units installed in the cockpit and the cabin. This equipment was formerly known as "cloud and collision warning radar."

THE INDUSTRY . . .

Aircraft Sealing Compounds

NEGOTIATIONS have recently been completed between British Paints, Ltd., and Products Research Co., Los Angeles, U.S.A., for the British company to undertake sales representation of PRC aircraft sealants in the United Kingdom and all sterling countries.

PRC products are widely used by both civil and military aircraft manufacturers in the United States. Included among them are brush and filleting compounds for integral fuel tanks; vapour sealing compounds; fill-and-drain solutions for integral fuel tanks; access-door sealers; moulding compounds for electrical components; and pressurized cabin sealers. United States manufacturers using PRC products are Lockheed, Boeing, Consolidated, Douglas, Martin, North American, Northrop and McDonnell.

Limited quantities of the PRC sealants are now available in this country to manufacturers engaged on work of national importance. Technical advice and information is available on application to British Paints, Ltd., Crewe House, Curzon Street, London, W.1 (Grosvenor 6401).

IN BRIEF

Marshal of the Royal Air Force Sir John C. Slessor, G.C.B., D.S.O., M.C., has joined the Board of Air Trainers, Ltd.

* * *

D. J. Engineering Co., Ltd., of St. Dunstan's Road, London, W.7, precision engineers and sheet-metal workers, have acquired the share capital of Wilson and Pearce, Ltd., Beaconsfield, Bucks, thus more than trebling their production capacity. Maj. J. Vivian Holman, A.F.R.Ae.S., M.I.Ae.S., will continue to act as aeronautical consultant to both companies, which are A.I.D. approved.

* * *

Dr. W. F. Hilton, chief aerodynamicist at Sir W. G. Armstrong Whitworth Aircraft, Ltd., had the degree of Doctor of Science conferred upon him by the University of London for his work in the field of aerodynamics; he is author of the book *High Speed Aerodynamics*. From A.W.A., also comes news of another academic distinction: Mr. E. M. Woodhams, 19-year-old son of the company's managing director, has gained his B.Sc. in aeronautical engineering.

G/C R. C. RICHMOND, recently appointed to the London office of Marconi's Wireless Telegraph Co., Ltd., for duties in connection with the company's aeronautical radio business. He joined the R.A.F. in 1929, and among appointments he held during the war were Chief Signals Officer in West Africa, in Coastal Command, and in Air Defence of Great Britain. Before retiring, G/C Richmond was C.O. of No. 2 Radio School, Yatesbury.

The laboratory division of Evode Ltd., Stafford, have evolved Evo-Led, a primer for use under strong solvent based finishing paints, such as chlorinated rubber and bituminous paints. Stringent tests, it is stated, have shown that the new primer can be safely overpainted in 24 hours.

* * *

Decca Radar, Ltd., announce that, in competition with other manufacturers, they have secured a contract for their Type 424 airfield control radar for service with the South African Air Force. Recent orders for this equipment have been received from a number of air forces (including the R.A.F. and the Royal Swedish Air Force), authorities and companies; Silver City Airways are to install the Type 424 at Ferryfield.

* * *

Mr. H. J. Finden, M.I.E.E., chief engineer of the electronic instruments laboratory of the Plessey Co., Ltd., was invited to the official opening, on September 8th, of the new laboratory of the U.S. Bureau of Standards at Boulder, Colorado. He will be in the United States for several weeks, making a general study of computing problems and electronic controls.

* * *

A. V. Roe Canada, Ltd., announce that Mr. J. R. Douglas has been appointed contracts administrator for the sales and service department of their aircraft division; he succeeds Mr. C. Luttman, who is now secretary of the recently formed Canadian Aeronautical Institute. Appointed to the newly created post of assistant contracts administrator is Mr. N. E. Kindell, LL.B.; an Englishman who joined Avro Canada in 1952, he served with the Fleet Air Arm throughout the war.

* * *

To mark the opening of the new northern offices of the Teddington group of companies, a number of the company's friends were recently entertained to luncheon. Mr. Stephen Sherlock explained that the functions of the new offices—which are at 31 Quay Street, Manchester (Blackfriars 2120) will include a technical and consultative service in connection with the products of Teddington Instruments Co., Ltd., which range from aircraft control equipment to refrigeration apparatus. The new office is under the management of Mr. E. Burgess.

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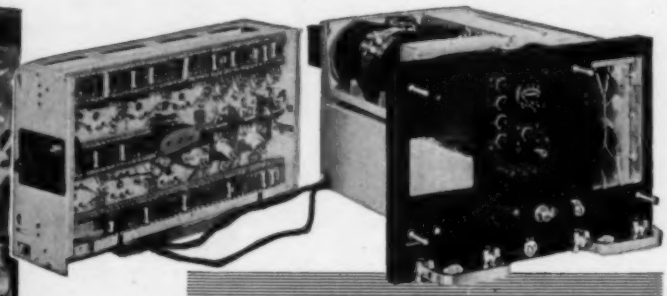

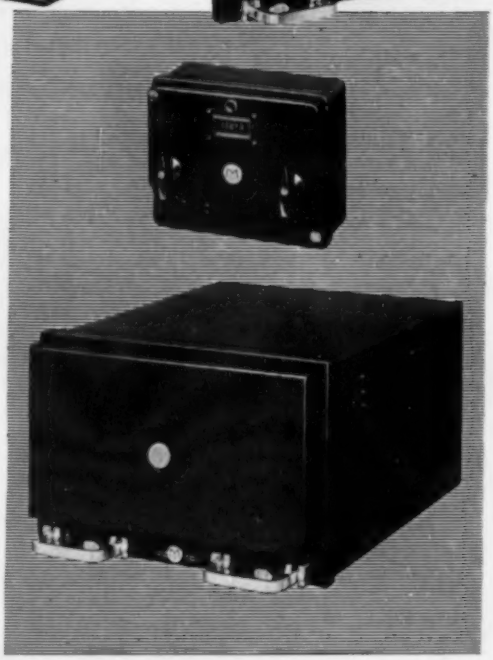

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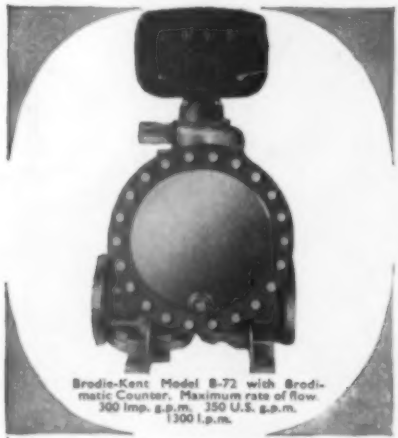
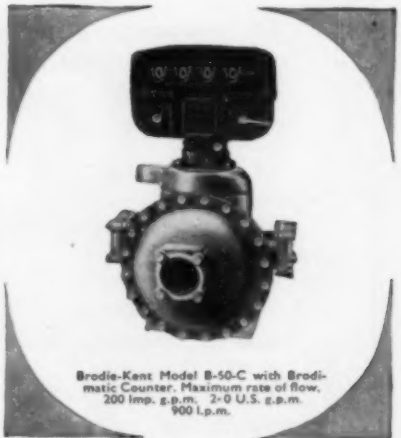


Brodie-Kent Model B-72 with Brodimatic Counter. Maximum rate of flow. 300 Imp. g.p.m. 350 U.S. g.p.m. 1300 l.p.m.



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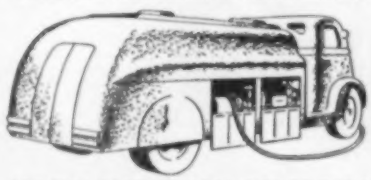

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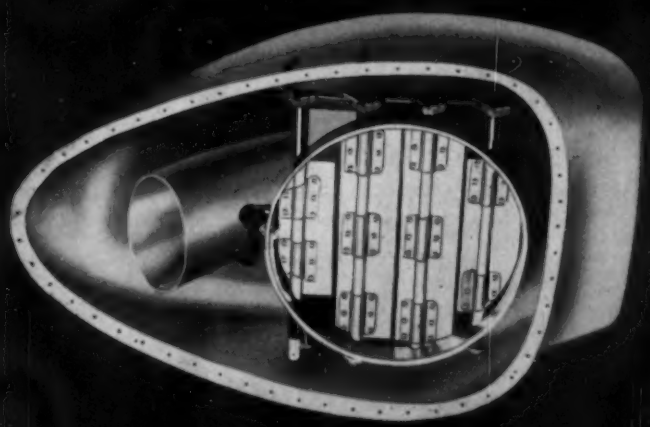
Right & Below AIR INTAKES CONSTRUCTED FROM PRESSINGS



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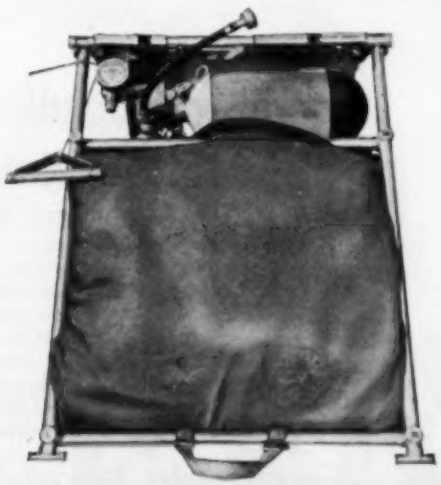

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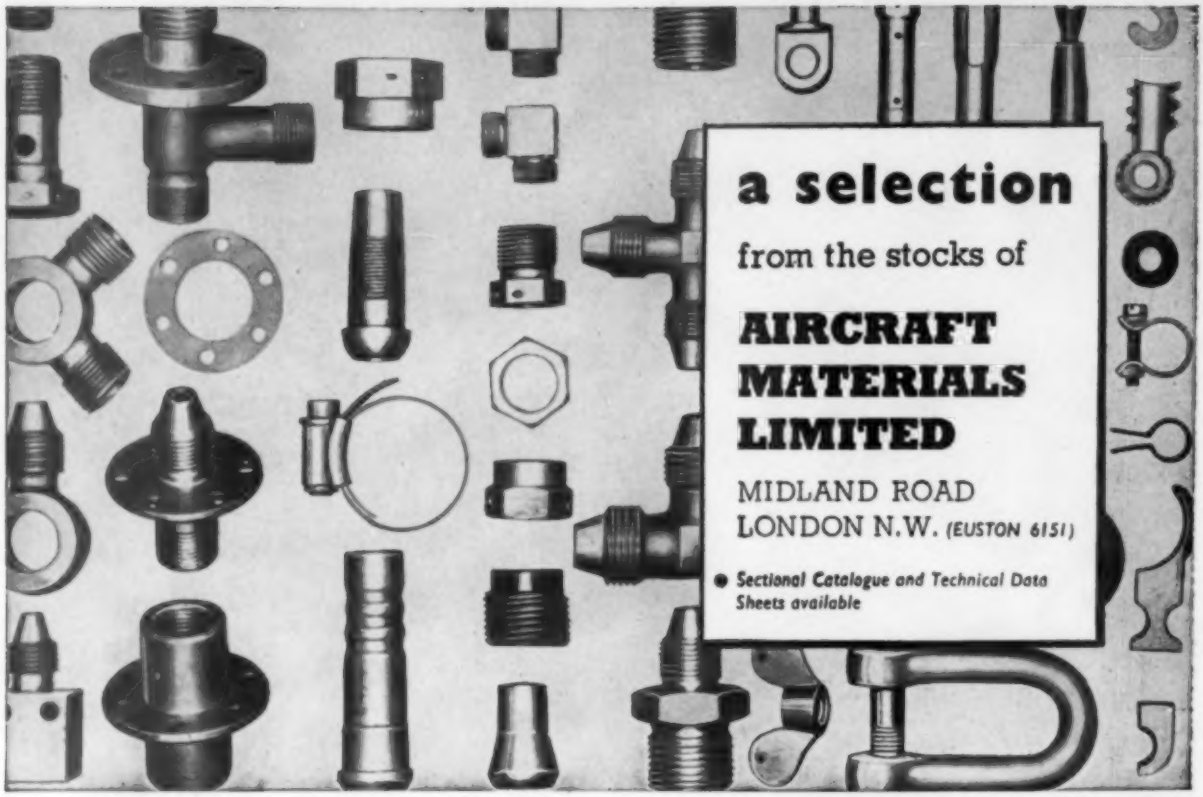

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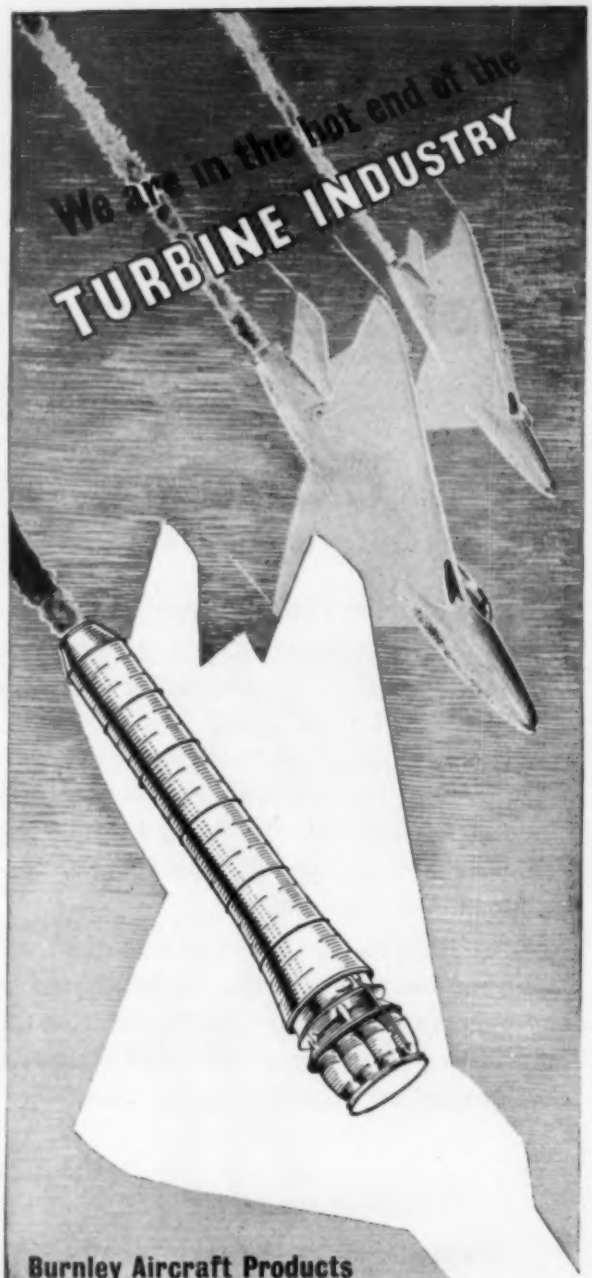

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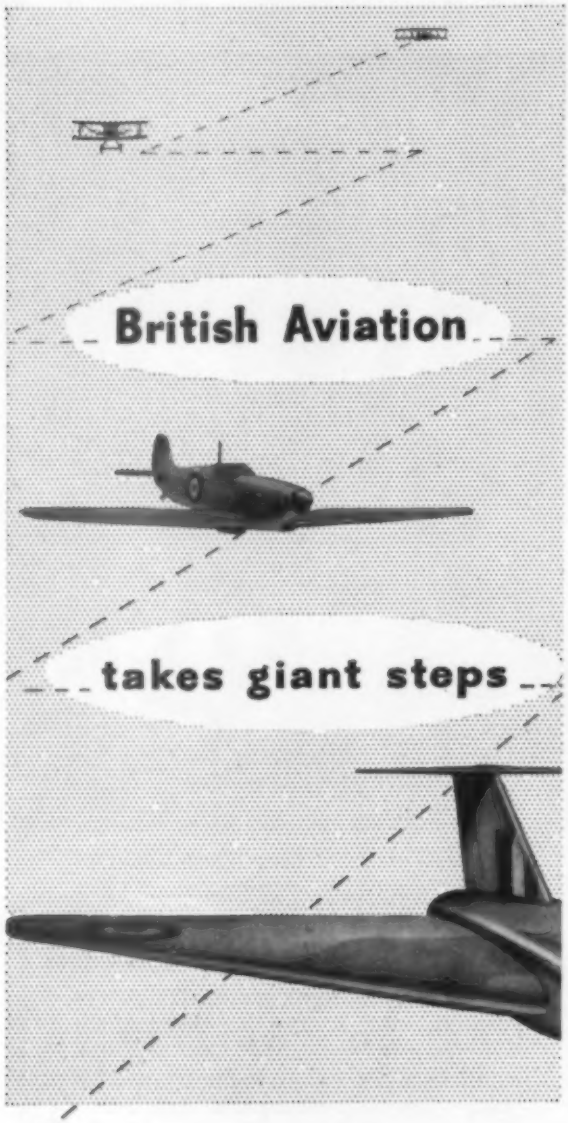

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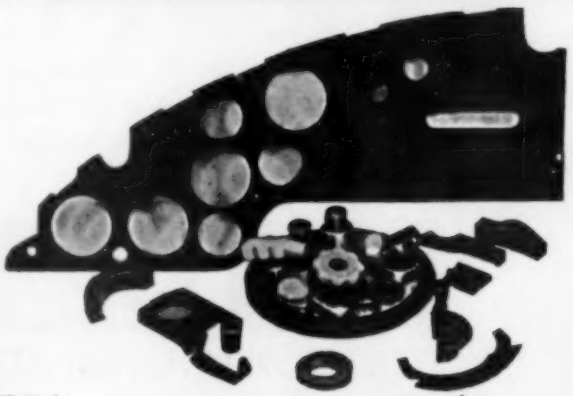

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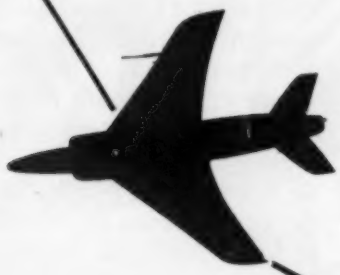

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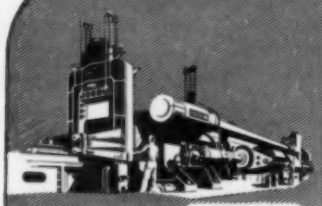

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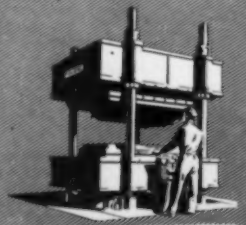

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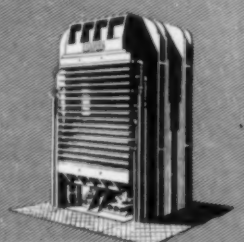

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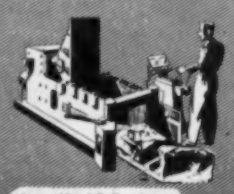

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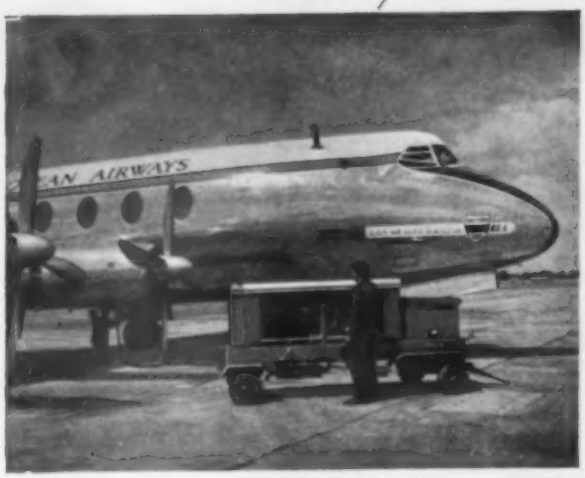

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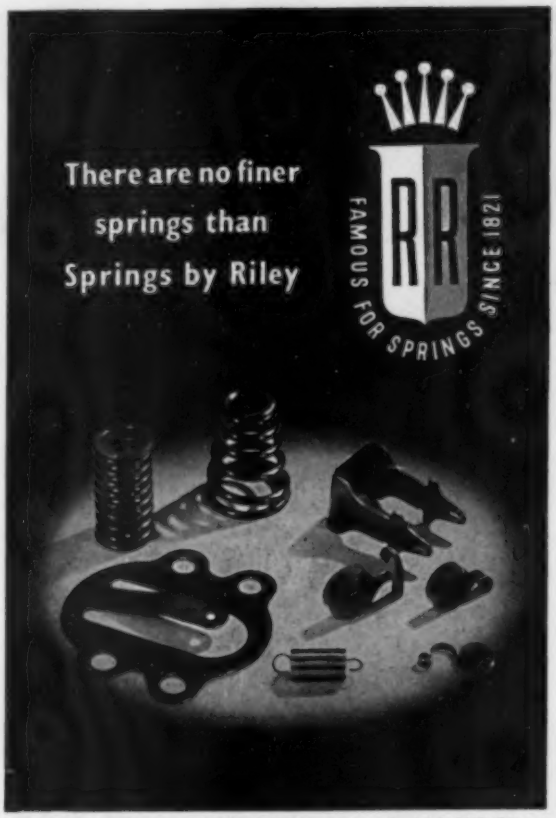

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM Airwork, Ltd., of 15 Chesterfield Street, London W.1, for the following inclusive Tour Services for the carriage of passengers and supplementary freight in conjunction with Whitehall Travel, Ltd., to be operated for a period of seven years from May 14th, 1955, during the season mid-May to mid-September each year at a frequency on each route of from one return service per fortnight to one return service per week:

APPLICATION No. 355. Between London (Blackbushe) and Biarritz with Viking aircraft.

APPLICATION No. 356. Between London (Blackbushe) and Klagenfurt with Dakota aircraft.

APPLICATION No. 357. Between London (Blackbushe) and Pisa with Viking aircraft.

APPLICATION No. 358. From Transair, Ltd., of Croydon Airport, Surrey, for an Inclusive Tour Service in conjunction with Raymond Cook, Ltd., for the carriage of passengers and supplementary freight to be operated with Dakota aircraft between London (Croydon or Gatwick) and Basle at a frequency of 11 return flights during the period between May 24th and September 6th, 1955.

APPLICATION No. 95/2. From Hunting-Clan Air Transport, Ltd., of 5 Fitzhardinge Street, London W.1, for permission to amend the route of their normal scheduled service between Newcastle-on-Tyne, Luxembourg and Basle (Application No. 95), approved by the Minister of Transport and Civil Aviation for operation at a frequency of up to three return flights during the period up to March 31st, 1960, to Newcastle-Brussels-Zurich.

FROM B.K.S. Air Transport, Ltd., of Dorset House, Old Burlington Street, London W.1.

APPLICATION No. 359 for a U.K. Internal Service with Dakota aircraft for the carriage of passengers, supplementary freight and mail between Leeds (Yeadon) and the Isle of Man (Ronaldsway) at a frequency of up to four return flights weekly during the season April to October inclusive for a period of seven years from May 1st, 1955.

APPLICATION No. 217/1 for the continuation of their Inclusive Tour Service for the carriage of passengers and supplementary freight, operated with Dakota aircraft between Newcastle and/or West Hartlepool and Tarbes for Lourdes at a frequency of from one to five return flights per week during the season April to September inclusive each year for the period up to September 30th, 1961, and for the inclusion of an optional traffic stop at Leeds (Yeadon) on that service.

APPLICATION No. 37/1 for an amendment to the Inclusive Tour Service which the Company are approved to operate between Newcastle and/or West Hartlepool and Paris with Dakota aircraft at a frequency of one return flight weekly during the period up to April 30th, 1960, so as to include a traffic stop at Leeds (Yeadon).

APPLICATION No. 35/1 for an amendment to the Internal Service which the Company are approved to operate with Dakota aircraft between Newcastle and/or West Hartlepool and Jersey and/or Guernsey at a frequency of two to nine return flights weekly during the period up to April 30th, 1960, so as to include a traffic stop at Leeds (Yeadon), and to increase the maximum frequency up to 21 return flights weekly. The Company also ask for changes, details of which may be obtained from the Secretary, in the fares approved for the service.

APPLICATION No. 216/2 for an amendment to the Internal Service (Application No. 216/1), which the Company are approved to operate with Dakota and Avro Anson aircraft on the route Newcastle and/or West Hartlepool-Bembridge, at a frequency of from one to three return flights per week during the period up to March 31st, 1961, so as to include traffic stops at Leeds (Yeadon) and Bournemouth (Hurn), and to increase the frequency to seven return flights weekly. The Company also ask for changes, details of which may be obtained from the Secretary, in the fares approved for the service.

APPLICATION No. 108/1 for an amendment to the Inclusive Tour Service which the Company are approved to operate with Dakota aircraft between Southend and Majorca (Palma) at a frequency of one return flight weekly during the season June to October inclusive each year for the period up to October 31st, 1959, so as to increase the frequency to two return flights weekly.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, Westminster, London S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections.

THE Air Transport Advisory Council also give notice that the following applications have now been withdrawn:—

APPLICATIONS Nos. 327 and 328 from Airwork, Ltd., of 15 Chesterfield Street, London W.1, for seasonal Vehicle Ferry Services with Bristol 170 aircraft between Birmingham (Elmdon) and Le Touquet and Cherbourg (Maisnertus) respectively, which were advertised in "The Times," "The Aeroplane" and "Flight" on August 27th, 1954. [2581

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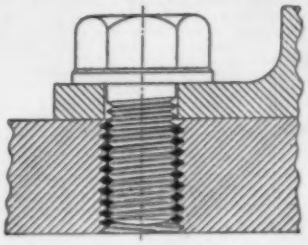

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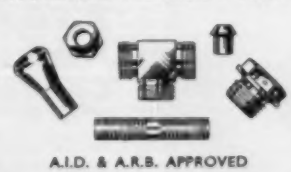

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INDEX TO ADVERTISERS

	Page
Acratork Engineering Co., Ltd.	48
Adcola Products, Ltd.	66
Aeroservices, Ltd.	66
Aircraft Materials, Ltd.	52
Air Charter, Ltd.	72
Air Service Training, Ltd.	60
Airscrew Co., and Jicwood, Ltd., The	50
Alvis, Ltd.	31
Armstrong Siddeley Motors, Ltd.	25
Aston and Co., Ltd., E. S.	58
Automatic Coil Winder and Electrical Equipment Co., Ltd.	58
Avery-Hardoll, Ltd.	46
Avica Equipment, Ltd.	57
Bakelite, Ltd.	26
B.B. Chemical Co., Ltd.	40
Blackburn and General Aircraft, Ltd.	5
Bramah and Co., Ltd., J. R.	49
Bristol Aeroplane Co., Ltd., The ... Cover	iv
British Emulsifiers, Ltd.	56
British Thomson-Houston Co., Ltd., The	57
British Timken, Ltd. ... Cover	iii
Brooklands Aviation, Ltd.	69
Burnley Aircraft Products, Ltd.	54
Canadair, Ltd.	24
Chloride Batteries, Ltd.	53
Connolly Brothers (Curriers), Ltd.	37
Corner and Co., Ltd., G.	55
Cross Manufacturing Co. (1938), Ltd. ... 68,	70
Curd Components, Ltd.	69
Decca Radar, Ltd.	20
De Havilland Aircraft Co., Ltd., The	30
Dunlop Rubber Co., Ltd. ... 34, 35,	69
Eagle Aircraft Services, Ltd.	67
Electro-Hydraulics, Ltd.	27
E.M.O. Instrumentation, Ltd.	62
English Electric Co., Ltd., The	45
E.R.S., Ltd.	55
Esso Petroleum Co., Ltd.	23
Expandite, Ltd.	43
Fairey Aviation Co., Ltd., The	29
Fiat	15
Fielding and Platt, Ltd.	61
Folland Aircraft, Ltd.	33
Gloster Aircraft Co., Ltd.	72
Godfrey and Partners, Ltd., Sir George	1
Goodmans Industries, Ltd.	11
Goodyear Tyre and Rubber Co. (Great Britain), Ltd., The	44
Graviner Manufacturing Co., Ltd., The	6
Habershon and Sons, Ltd., J. J.	65
Hawker Aircraft, Ltd. ... Cover	i
Hellermann, Ltd. ... Cover	ii
Helliwells, Ltd.	38
High Pressure Components, Ltd.	39
Hordern-Richmond (Sales), Ltd.	18
Hunting Percival Aircraft, Ltd.	68
Hymatic Engineering Co., Ltd., The	70
Ilford, Ltd.	10
Iliffe and Sons, Ltd.	52
Jet Tanks, Ltd.	56
Kidde Co., Ltd., Walter, The	51
Lacy-Hulbert and Co., Ltd.	41
Latex Upholstery, Ltd.	71
Lewis, Ltd., D.	68
Leytonstone Jig and Tool Co., Ltd.	60
Lockheed Aircraft Corporation ... 2,	3
Lucas (Gas Turbine Equipment), Ltd., Joseph ... 39, 70,	71
Marconi's Wireless Telegraph Co., Ltd.	47
Marston Excelsior, Ltd.	59
Martin-Baker Aircraft, Ltd.	32
M.L. Aviation Co., Ltd. ... 56,	70
Modern Industrial Finishes, Ltd.	61
Mollart Engineering Co., Ltd., The	65
Muir and Adie, Ltd.	68
Murex Welding Processes, Ltd.	64
National Institute of Engineering	68
Opperman, Ltd., S. E.	64
Palmer Tyre, Ltd., The	71
Park, Ltd., R. and J.	60
Paul, Ltd., W. H.	4
Peto and Radford	16
Plessey Co., Ltd., The	42
R.A.F. Benevolent Fund, The	21
Redifon, Ltd.	12
Regent, Ltd., L. K.	66
R.F.D. Co., Ltd.	13
Riley, Ltd., Robert	64
Rists Wires and Cables, Ltd.	63
Robinson and Co. (Gillingham), Ltd., L.	19
Roe and Co., Ltd., A. V.	22
Rotax, Ltd.	28
Ruberoid Co., Ltd., The	62
Rumbold and Co., Ltd., L. A.	9
Short Brothers and Harland, Ltd.	17
Siegrist-Orel, Ltd.	62
Smiths Aircraft Instruments, Ltd.	36
Sperry Gyroscope Co., Ltd.	8
Staravia	68
Stemco, Ltd.	48
Teddington Controls, Ltd.	14
Thermal Control Co., Ltd.	54
Venner, Ltd.	63
Vickers-Armstrongs, Ltd. ... 7,	70
Vokes, Ltd.	58
West and Partners, Ltd., A.	50
Western Manufacturing (Reading), Ltd.	71
Wilson and Sons (London), Ltd., W.	46
Wolverhampton Aviation, Ltd.	66

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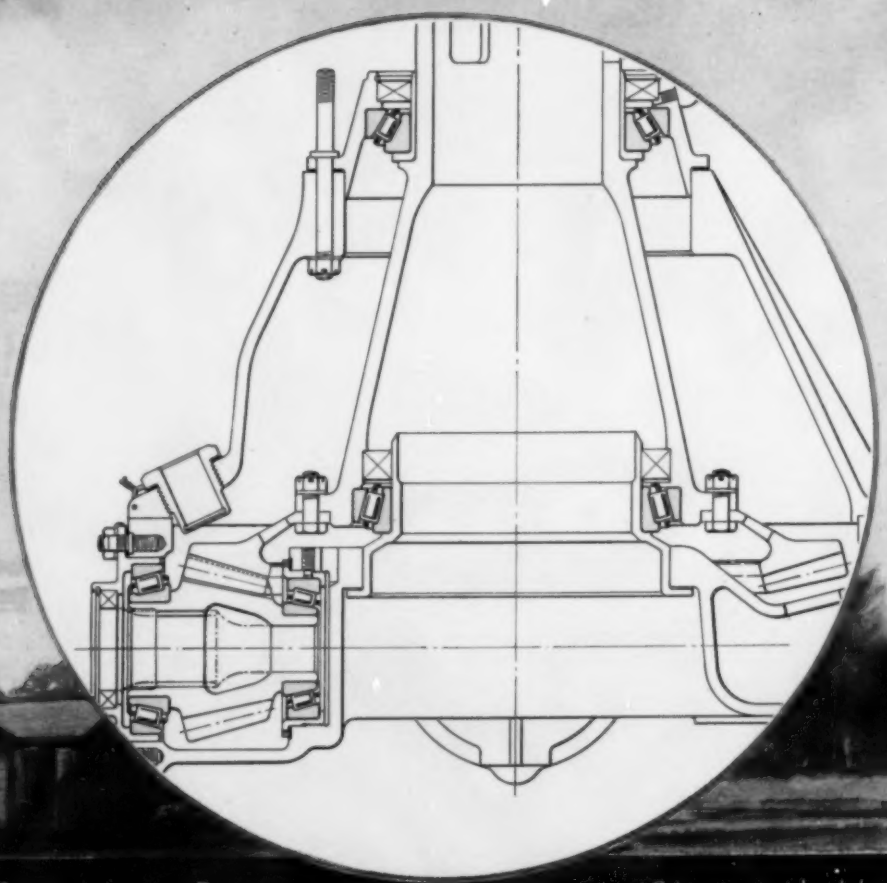

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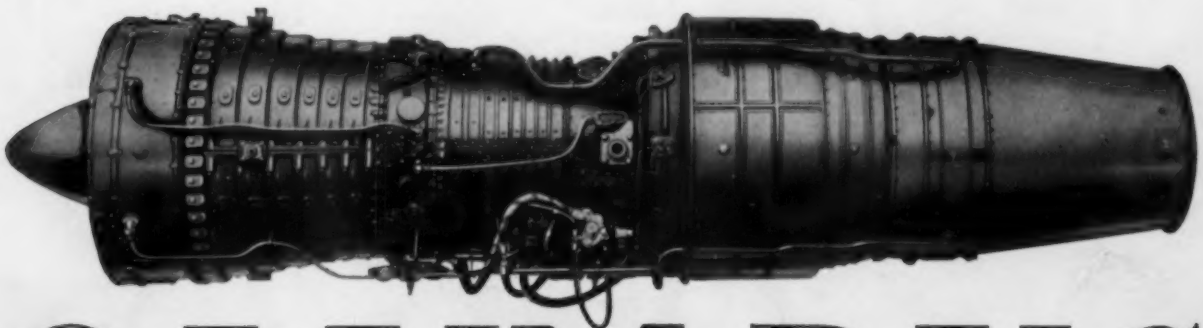

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